NOMADIX®
ACCESS GATEWAY

User Guide

Version 8.5

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Access Gateway

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Product Information

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For technical support information, see the Appendix in this User Guide.

Write your product serial number in this box:

S/N

Patent Information

Please see the Nomadix website for a list of US and foreign patents covering this product release.

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WARNING

Risk of electric shock; do not open; no user-serviceable parts inside.

AVERTISSEMENT

Risque de choc electrique; ne pas ouvrir; ne pas tenter de demontre l'appareil.

WARNUNG

Nicht öffnen; elektrische Bauteile.

AVISO

Riesgo de shock eléctrico. No abrir. No hay piezas configurables dentro.

CAUTION

Read the instruction manual prior to operation.

ATTENTION

Lire le mode d'emploi avant utilisation.

ACHTUNG

Lesen Sie das Handbuch bevor Sie das Gerät in Betrieb nehmen.

PRECAUCIÓN

Leer el manual de instrucciones antes de poner en marcha el equipo.

NOMADIX®

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Introduction

About this Guide

This User Guide provides information and procedures that will enable system administrators to install, configure, manage, and use the Access Gateway product successfully and efficiently. Use this guide to take full advantage of the Access Gateway's functionality and features.

Refer to "Product Specifications" on page 298 for a list of Access Gateway Products that this document supports.

The Nomadix Access Gateway hardware is configured and controlled by Nomadix Service Engine (NSE) software. The NSE 7.4 is the last Software Release that supports the AG2300, AG3100, and AG5500.

NSE 8.5 series software releases support the AG2400, AG5600, AG5800 and AG5900.

Organization

This User Guide is organized into the following sections:

Chapter 1 – Introduction. The current chapter; an introduction to the features and benefits of the Nomadix Access Gateway.

Chapter 2 – Installing the Access Gateway. Provides instructions for installing the Access Gateway and establishing the start-up configuration.

Chapter 3– System Administration. Provides all the instructions and procedures necessary to manage and administer the Access Gateway on the customer's network, following a successful installation.

Chapter 4– The Subscriber Interface. Provides an overview and sample scenario for the Access Gateway's subscriber interface. It also includes an outline of the authorization and billing processes utilized by the system, and the Nomadix Information and Control Console.

Chapter 5 – Quick Reference Guide. Contains product reference information, organized by topic and functionality. It also contains a full listing of all product configuration elements, sorted alphabetically and by menu.

Chapter 6 – Troubleshooting. Provides information to help you resolve common hardware and software problems. It also contains a list of error messages associated with the management interface.

Technical Support. Informs you how to obtain technical support. Refer to Troubleshooting before contacting Nomadix, Inc. directly.

Glossary of Terms. Provides an explanation of terms directly related to Nomadix product technology. Glossary entries are organized alphabetically.

Welcome to the Access Gateway

The Access Gateway is a freestanding, fully featured network appliance that enables public access service providers to offer broadband Internet connectivity to their customers.

The Access Gateway handles transparent connectivity, advanced security, policy-based traffic shaping, and service placement supporting thousands of users simultaneously in a broadband environment. The Access Gateway also offers a unique set of security and connectivity features for deploying metro wireless 802.11 networks, including Mesh and WiMAX technologies.

Access Gateway

The Access Gateway yields a complete solution to a set of complex issues in the Enterprise, Public-LAN, and Residential segments.

Product Configuration and Licensing

All Nomadix Access Gateway products are powered by our patented and patent-pending suite of embedded software, called the Nomadix Service Engine™ (NSE). The Access Gateway employs our NSE core software package and comes pre-packaged with the option to purchase additional modules to expand the product's functionality.

This User Guide covers all features and functionality provided with the NSE core package, as well as additional optional modules. Your product license must support the optional NSE modules if you want to take advantage of the expanded functionality. The following note will preface procedures that directly relate to optional modules.

See also:

- NSE Core Functionality
- Optional NSE Modules

Key Features and Benefits

The Access Gateway is a 1U high, free-standing or rack-mountable device that provides Ethernet ports to interface with the router and the aggregation equipment within the network. It also incorporates an RS232 serial port for connecting to a Property Management System (PMS) and for system management and administration, while maintaining one billing relationship with their chosen provider.

The Access Gateway enables a wide variety of network deployment options for different venue types. For example:

- Allows for flexible WAN Connectivity (T1/E1, Cable, xDSL, and ISDN).
- Supports 802.11a/b/g and hybrid networks utilizing wired Ethernet.
- Supports key requirements needed to be compliant with the Wi-Fi ZONE™ program.
- Allows you to segment your existing network into public and private sections using VLANs, then leverage your existing network investment to create new revenue streams.
- Enables you to provide Wi-Fi access as a billable service or as an amenity to augment the main line of business for your venue.
- Contains an advanced XML interface for accepting and processing XML commands, allowing the implementation of a variety of service plans and offerings.
- Offers three user-friendly ways of remote management—through a Web interface, SNMP MIBs, and Telnet interfaces—allowing for scalable, large public access deployments.
- Provides capabilities for load balancing and fail-over management across multiple ISPs.

Platform Reliability

The Access Gateway is designed as a network appliance, providing maximum uptime and reliability unlike competitive offerings that use a server-based platform.

Local Content and Services

The Access Gateway's Portal Page feature intercepts the user's browser settings and directs them to a designated Web site to securely sign up for service or log in if they have a pre-existing account.

- Allows the provider to present their customers with local services or have the user sign up for service at zero expense.

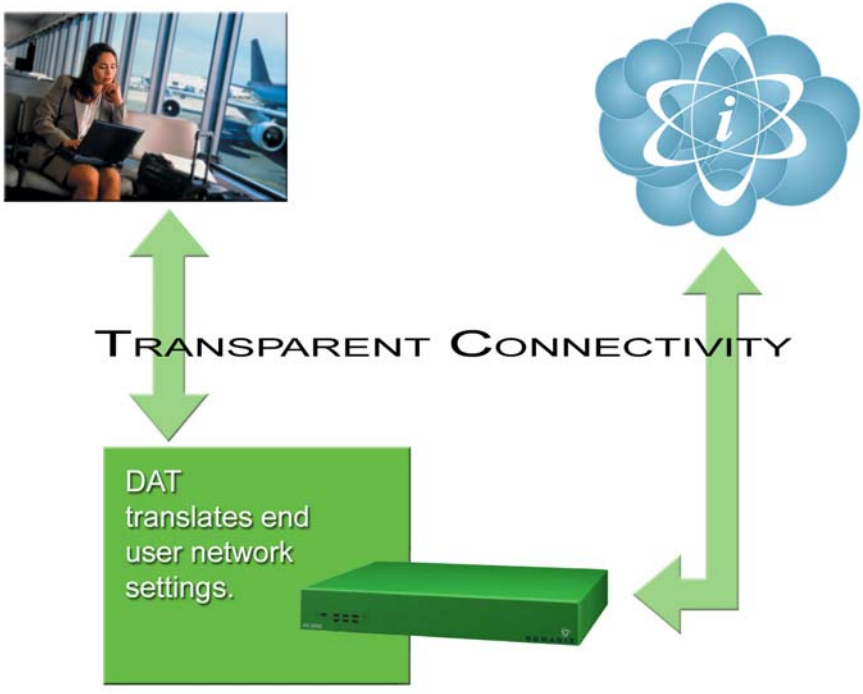
- Offers both pre and post authentication redirects of the user's browser, providing maximum flexibility in service branding.

Transparent Connectivity

Resolving configuration conflicts is difficult and time consuming for network users who are constantly on the move, and costly to the solution provider. In fact, most users are reluctant to make changes to their computer's network settings and won't even bother. This fact alone has prevented the widespread deployment of broadband network services.

Our patented Dynamic Address Translation™ (DAT) functionality offers a true "plug and play" solution by enabling a seamless and transparent experience and the tools to acquire new customers on-site.

DAT greatly reduces provisioning and technical support costs and enables providers to deliver an easy to use, customer-friendly service.



Billing Enablement

The Access Gateway supports billing plans using credit cards, scratch cards, or monthly subscriptions, or direct billing to a hotel's Property Management System (PMS) and can base the billable event on a number of different parameters such as time, volume, IP address type, or bandwidth.

Access Control and Authentication

The Access Gateway ensures that all traffic to the Internet is blocked until authentication has been completed, creating an additional level of security in the network. Also, the Access Gateway allows service providers to create their own unique "walled garden," enabling users to access only certain predetermined Web sites before they have been authenticated.

Nomadix simultaneously supports the secure browser-based Universal Access Method (UAM), IEEE 802.1x, and Smart Clients for companies such as Adjungo Networks, Boingo Wireless, GRIC and iPass. MAC-based authentication is also available.

Security

The patented iNAT™ (Intelligent Network Address Translation) feature creates an intelligent mapping of IP Addresses and their associated VPN tunnels—by far the most reliable multi-session VPN passthrough to be tested against diverse VPN termination servers from companies such as Cisco, Checkpoint, Nortel and Microsoft. Nomadix' iNAT feature allows multiple tunnels to be established to the same VPN server, creating a seamless connection for all users on the network.

The Access Gateway provides fine-grain management of DoS (Denial of Service) attacks through its Session Rate Limiting (SRL) feature, and MAC filtering for improved network reliability.

5-Step Service Branding

A network enabled with the Nomadix Access Gateway offers a 5-Step service branding methodology for service providers and their partners, comprising:

1. Initial Flash Page branding.
2. Initial Portal Page Redirect (Pre-Authentication). Typically, this is used to redirect the user to a venue-specific Welcome and Login page.
3. Home Page Redirect (Post-Authentication). This redirect page can be tailored to the individual user (as part of the RADIUS Reply message, the URL is received by the NSE) or set to re-display itself at freely configurable intervals.

4. The Information and Control Console (ICC) contains multiple opportunities for an operator to display its branding or the branding of partners during the user's session. As an alternative to the ICC, a simple pop-up window provides the opportunity to display a single logo.
5. The "Goodbye" page is a post-session page that can be defined either as a RADIUS VSA or be driven by the Internal Web Server (IWS) in the NSE. Using the IWS option means that this functionality is also available for other post-paid billing mechanisms (for example, post-paid PMS).

NSE Core Functionality

Powering Nomadix' family of Access Gateways, the Nomadix Service Engine (NSE) delivers a full range of features needed to successfully deploy public access networks. These "core" features solve issues of connectivity, security, billing, and roaming in a Wi-Fi public access network.

The NSE's core package of features includes:

- Access Control
- Bandwidth Management
- Billing Records Mirroring
- Bridge Mode
- Class-Based Queueing
- Command Line Interface
- Credit Card
- Dynamic Address Translation™
- Dynamic Transparent Proxy
- End User Licensee Count
- External Web Server Mode
- Facebook Authentication
- "Adding and Updating Port-Location Assignments {Add}" on page 192Home Page Redirect
- iNAT™
- Information and Control Console
- Internal Web Server
- International Language Support
- IP Upsell
- Logout Pop-Up Window
- MAC Filtering
- Multi-Level Administration Support
- Multi-WAN Interface Management
- NTP Support

- Portal Page Redirect
- RADIUS Client
- RADIUS-driven Auto Configuration
- RADIUS Proxy
- Realm-Based Routing
- Remember Me and RADIUS Re-Authentication
- Secure Management
- Secure Socket Layer (SSL)
- Secure XML API
- Session Rate Limiting (SRL)
- Session Termination Redirect
- Smart Client Support
- SNMP Nomadix Private MIB
- Static Port Mapping
- Tri-Mode Authentication
- URL Filtering
- Walled Garden
- Web Management Interface
- Weighted Fair Queueing

Access Control

For IP-based access control, the NSE incorporates a master access control list that checks the source (IP address) of administrator logins. A login is permitted only if a match is made with the master list contained within the NSE. If a match is not made, the login is denied, even if a correct login name and password are supplied.

The access control list supports up to 50 (fifty) entries in the form of a specific IP address or range of IP addresses.

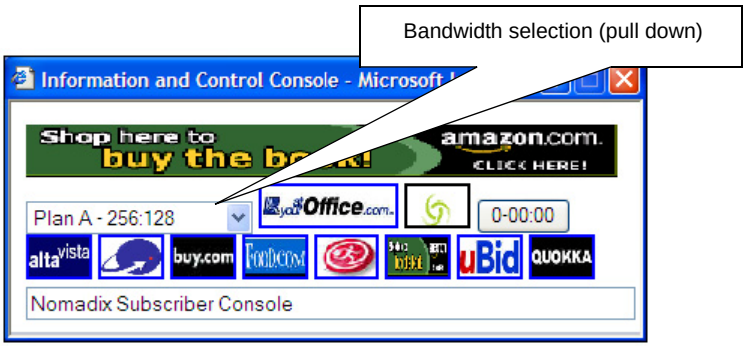
The NSE also offers access control based on the interface being used. This feature allows administrators to block access from Telnet, Web Management, and FTP sources.

Administration can now be performed after unblocking the interfaces for the Subscriber side of the NSE. The Administrative ports are configurable as well. See “Establishing Secure Administration {Access Control}” on page 91.

Bandwidth Management

The NSE optimizes bandwidth by limiting bandwidth usage symmetrically or asymmetrically on a per device (MAC address / User) basis, and manages the WAN Link traffic to provide complete bandwidth management over the entire network. You can ensure that every user has a quality experience by placing a bandwidth ceiling on each device accessing the network, so every user gets a fair share of the available bandwidth.

With the Nomadix ICC feature enabled, subscribers can increase or decrease their own bandwidth and pricing plans for their service dynamically.



Information and Control Console (ICC)

Billing Records Mirroring

NSE-powered devices can send copies of credit card billing records (and optionally, PMS) to external servers that have been previously defined by system administrators. The NSE assumes control of billing transmissions and the saving of billing records. By effectively “mirroring” the billing data, the NSE can send copies of billing records to predefined “carbon copy” servers. Additionally, if the primary and secondary servers are not responding, the NSE can store up to 2,000 billing records. The NSE regularly attempts to connect with the primary and secondary severs. When a connection is re-established (with either server), the NSE sends the cached information to the server. Customers can be confident that their billing information is secure and that no transaction records are lost.

Bridge Mode

This feature allows complete and unconditional access to devices. When Bridge Mode is enabled, your NSE-powered product is effectively transparent to the network in which it is located.

The NSE forwards any and all packets (except those addressed to the NSE network interface). The packets are unmodified and can be forwarded in both directions. The Bridge Mode function is a very useful feature when troubleshooting your entire network as it allows administrators to effectively “remove” your product from the network without physically disconnecting the unit.

Class-Based Queueing

The Nomadix Class-Based Queueing feature provides the ability to define multiple groups (classes) of users. You can prioritized groups and guarantee minimum bandwidth on a per-group basis.

In NSE 8.5, Class Based Queueing and Weighted Fair Queueing are mutually exclusive. Weighted Fair Queueing is enabled by default.

Users are added to classes, and rules are applied across the entire class. Each class has three configurable attributes:

- Priority
- Minimum Bandwidth
- Maximum Bandwidth

Class-based queueing does not apply rules to individual users. You may use bandwidth limits to restrict individual users, if desired.

Class-based queueing does not provide application-level (layer 7) throttling or class of service.

Rules are applied when there is contention for bandwidth (i.e. when link is saturated).

Use Case: Property has 100 Mbps WAN Link

In this scenario, a property wishes to provide guaranteed minimum bandwidth and prioritize traffic across three groups: Conference, Guest Room, Public Areas. The property can configure class-based queuing according to the following table.

Class	Priority	Minimum	Maximum	User Bandwidth Limit**
Conference	1	30 Mbps	100 Mbps	5 Mbps
Guest Room	2	50 Mbps	100 Mbps	5 Mbps
Public	3	20 Mbps	100 Mbps	3 Mbps

User Bandwidth Limit is not an attribute of Class Based Queueing, but can be applied (if desired) using existing Bandwidth Limit functionality.

The sum of minimums across all classes should not exceed the total available bandwidth.

It is generally recommended to set the Maximum to equal the total available bandwidth across all classes. This allows all classes to take advantage of the full bandwidth when there is no contention.

With the above configuration, each of the three classes may utilize the entire available bandwidth when there is no contention. But whenever contention occurs, bandwidth will be allocated according to priority and minimum guarantee.

For example, if there are no users in the Conference Class, then the Guest Room and Public Classes can use 100% of the bandwidth. If there is contention between the two, then the Guest Room class will be allocated up to 80Mbps (because it has a higher priority), with 20Mbps taken by the Public class (its minimum guarantee). If, however, there were no users in the Public class, then the Guest Room class could take 100% of the bandwidth (100Mbps).

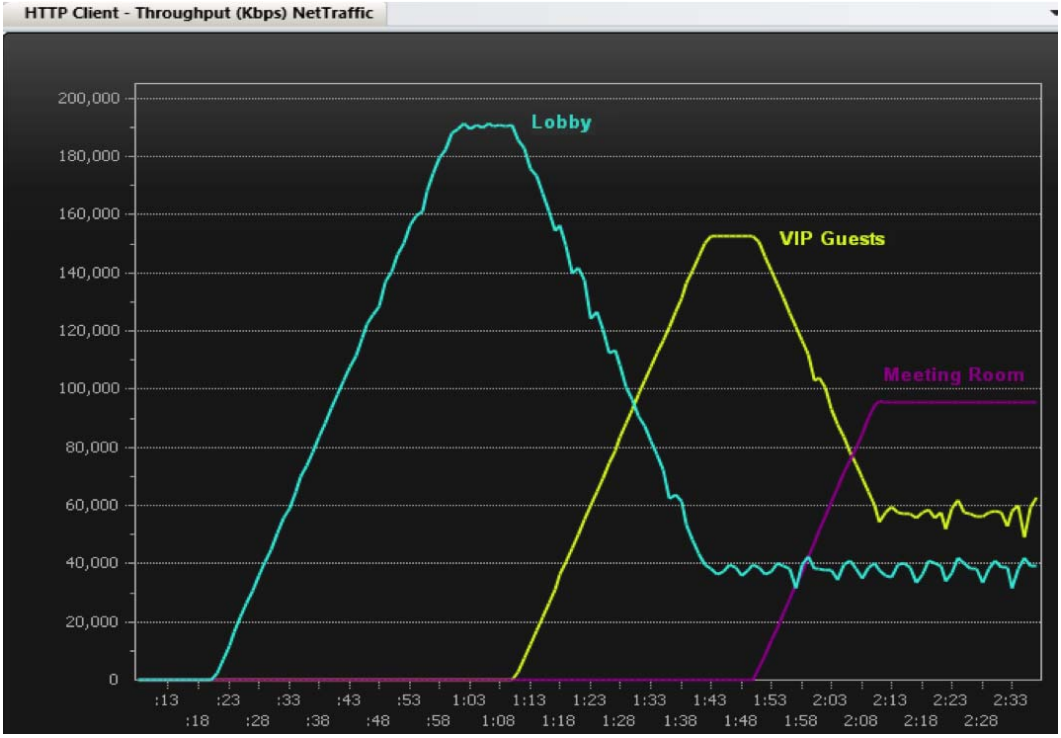
If users are introduced into the Conference class (Priority 1), and this creates contention, then they will take bandwidth away from each of the other two classes until each reaches its minimum.

Example Illustration of Class-Based Queueing

The following diagram demonstrates the effect of Class Based Queueing with a saturated link of 200Mbps, and three classes defined with minimum guarantees of 100Mbps (Meeting Room), 60Mpbs (VIP Guests), and 40Mbps (Lobby).

Note the following over time:

- When only Lobby class subscribers are on the network, all available bandwidth is allocated to Lobby class subscribers.
- As VIP Guests join the network, bandwidth is allocated from Lobby class to VIP Guests, until the Lobby bandwidth drops to its minimum guarantee of 40Mbps.
- As Meeting Room subscribers join the network, the Lobby bandwidth is already at its minimum guarantee. Bandwidth is allocated from VIP Guests to Meeting Room subscribers, until bandwidth for VIP Guests reaches the minimum guarantee of 60Mbps and Meeting Room reaches its minimum guarantee of 100Mbps.



Notes and Cautions

Exercise caution in mixing subscribers with and without class membership. Subscribers with no class membership are automatically assigned a priority of eight the lowest priority and have no minimum bandwidth.

If higher priority classes are not assigned a maximum bandwidth cap, it is possible that unassigned subscribers will be completely starved for bandwidth.

In a mixed user environment, care should be taken to ensure top priority classes have sensible maximum thresholds. To take advantage of the class bandwidth queuing one should assign subscribers to a minimum bandwidth and specific class.

See also "Class-Based Queueing" on page 102.

Command Line Interface

The Command Line Interface (CLI) is a character-based user interface that can be accessed remotely or via a direct cable connection. Until your Nomadix product is up and running on the network, the CLI is the Network Administrator's window to the system. Software upgrades can only be performed from the CLI.

See also "The Management Interfaces (CLI and Web)" on page 55.

Credit Card

The Credit Card provides a secure interface over SSL to enable billing via a credit card for High Speed Internet Access (HSIA). This module also includes the Bill Mirror functionality for posting of billing records to multiple sources.

See also:

- "Secure Socket Layer (SSL)" on page 24.
- "Billing Records Mirroring" on page 10.

Dynamic Address Translation™

Dynamic Address Translation (DAT) enables transparent broadband network connectivity, covering all types of IP configurations (static IP, DHCP, DNS), regardless of the platform or the operating system used—ensuring that everyone gets access to the network without the need for changes to their computer's configuration settings or client-side software. The NSE supports both PPTP and IPSec VPNs in a manner that is transparent to the user and that provides a more secure standard connection. See also, "Transparent Connectivity" on page 5.

Dynamic Transparent Proxy

The NSE directs all HTTP and HTTPS proxy requests through an internal proxy which is transparent to subscribers (no need for users to perform any reconfiguration tasks). Uniquely, the NSE also supports clients that dynamically change their browser status from non-proxy to proxy, or vice versa. In addition, the NSE supports proxy ports 80, 800-900, 911 and 990 as well as all unassigned ports (for example, ports above 1024), thus ensuring far fewer proxy related support calls than competitive products.

End User Licensee Count

The NSE supports a range of simultaneous user counts depending on the Nomadix Access Gateway you choose. In addition, depending on your platform, various user count upgrades are available for each of our NSE-powered products that allow you to increase the simultaneous user count.

External Web Server Mode

The External Web Server (EWS) interface is for customers who want to develop and use their own content. It allows you to create a "richer" environment than is possible with your product's embedded Internal Web Server.

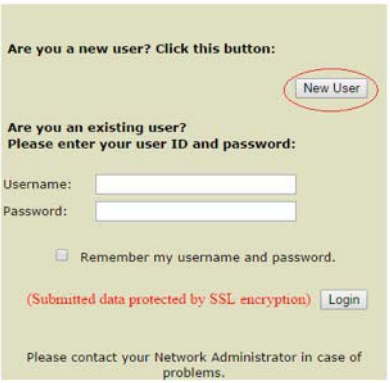
The advantages of using an External Web Server are:

- Manage frequently changing content from one location.
- Serve different pages depending on site, sub-location (for example, VLAN), and user.
- Take advantage of the comprehensive Nomadix XML API to implement more complex billing plans.
- Recycle existing Web page content for the centrally hosted portal page.

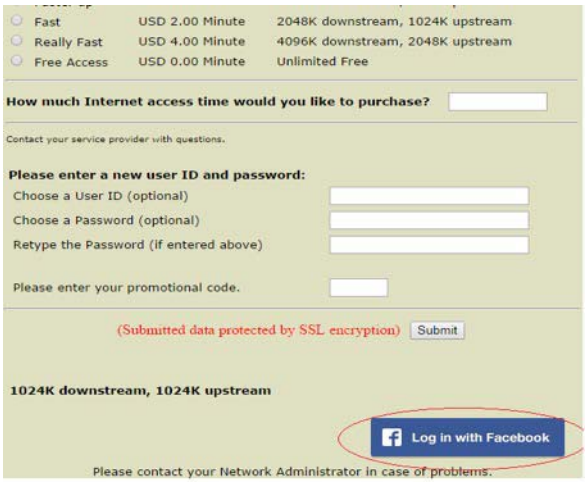
If you choose to use the EWS interface, Nomadix Technical Support can provide you with sample scripts. See also, "Contact Information" on page 349.

Facebook Authentication

NSE 8.5 provides the option of Facebook authentication for facility guests. Login with Facebook is a 2-step process. A user must first click the New User button on the Nomadix splash screen:


Are you a new user? Click this button:
New User
Are you an existing user?
Please enter your user ID and password:
Username:
Password:
Remember my username and password.
(Submitted data protected by SSL encryption)
Login
Please contact your Network Administrator in case of problems.

Then the user must click the “Log in with Facebook” button:


Fast USD 2.00 Minute 2048K downstream, 1024K upstream
Really Fast USD 4.00 Minute 4096K downstream, 2048K upstream
Free Access USD 0.00 Minute Unlimited Free
How much Internet access time would you like to purchase?
Contact your service provider with questions.
Please enter a new user ID and password:
Choose a User ID (optional)
Choose a Password (optional)
Retype the Password (if entered above)
Please enter your promotional code.
(Submitted data protected by SSL encryption)
Submit
1024K downstream, 1024K upstream
Log in with Facebook
Please contact your Network Administrator in case of problems.

Several configuration steps are required to support Facebook authentication. See the following sections for specific instructions:

- “Defining the AAA Services {AAA}” on page 80
- “Assigning Passthrough Addresses {Passthrough Addresses}” on page 135
- “Defining the Billing Options {Billing Options}” on page 217
- “Adding and Updating Port-Location Assignments {Add}” on page 192Home Page Redirect

The NSE supports a comprehensive HTTP redirect logic that allows network administrators to define multiple instances to intercept the browser's request and replace it with freely configurable URLs.

Portal page redirect enables redirection to a portal page **before** the authentication process. This means that anyone will get redirected to a Web page to establish an account, select a service plan, and pay for access. Home Page redirect enables redirection to a page **after** the authentication process (for example, to welcome a specific user to the service—after the user has been identified by the authentication process. See also, "Portal Page Redirect" on page 21.

iNAT™

Nomadix invented a new way of intelligently supporting multiple VPN connections to the same termination at the same time (iNAT™), thus solving a key problem of many public access networks.

Nomadix' patented iNAT™ (intelligent Network Address Translation) feature contains an advanced, real-time translation engine that analyzes all data packets being communicated between the private address realm and the public address realm.

The NSE performs a defined mode of network address translation based on packet type and protocol (for example, ISAKMP, etc.). UDP packet fragmentation is supported to provide more seamless translation engine for certificate-based VPN connections.

If address translation is needed to ensure the success of a specific application (for example, multiple users trying to access the same VPN termination server at the same time), the packet engine selects an IP address from a freely definable pool of publicly routable IP addresses. The same public IP address can be used as a source IP to support concurrent tunnels to different termination devices—offering unmatched efficiency in the utilization of costly public IP addresses. If the protocol type can be supported without the use of a public IP (for example, HTTP, FTP), our proven Dynamic Address Translation™ functionality continues to be used.

Some of the benefits of iNAT™ include:

- Improves the success rate of VPN connectivity by misconfigured users, thus reducing customer support costs and boosting customer satisfaction.
- Maintains the security benefits of traditional address translation technologies while enabling secure VPN connections for mobile workers accessing corporate resources from a public access location.
- Dynamically adjusts the mode of address translation during the user's session, depending on the packet type.
- Supports users with static private IP addresses (for example, 192.168.x.x) or public (different subnet) IP addresses without any changes to the client IP settings.
- Dramatically heightens the reusability factor of costly public IP addresses.

Information and Control Console

The Nomadix ICC is a HTML-based pop-up window that is presented to subscribers with their Web browser. The ICC allows subscribers to select their bandwidth and billing options quickly and efficiently from a simple pull-down menu. For credit card accounts, the ICC displays a dynamic “time” field to inform subscribers of the time remaining on their account.

Information and Control Console (ICC)

Additionally, the ICC contains multiple opportunities for an operator to display its branding or the branding of partners during the user’s session, as well as display advertising banners and present a choice of redirection options to their subscribers.

See also:

- 5-Step Service Branding
- Logout Pop-Up Window
- Information and Control Console

Initial NSE Configuration

See “Installing the Access Gateway” on page 43 for initial installation and configuration instructions.

Internal Web Server

The NSE offers an embedded Internal Web Server (IWS) to deliver Web pages stored in flash memory. These Web pages are configurable by the system administrator by selecting various parameters to be displayed on the internal pages. When providers or HotSpot owners do not want to develop their own content, the IWS is the answer. A banner at the top of each IWS page is configurable and contains the customer's company logo or any other image file they desire.

To support PDAs and other hand-held devices, the NSE automatically formats the IWS pages to a screen size that is optimal for the particular device being used.

See also:

- 5-Step Service Branding.
- International Language Support.

International Language Support

The NSE allows you to define the text displayed to your users by the IWS without any HTML or ASP knowledge. The language you select determines the language encoding that the IWS instructs the browser to use. See also, "Internal Web Server" on page 18.

You can change the language of the Web Management Interface text. See "Selecting the language of the Web Management Interface" on page 78.

The available language options are:

- English
- Chinese (Big 5)
- French
- German
- Japanese (Shift_JIS)
- Spanish
- Other, with drop-down menu

IP Upsell

System administrators can set two different DHCP pools for the same physical LAN. When DHCP subscribers select a service plan with a public pool address, the NSE associates their MAC address with their public IP address for the duration of the service level agreement. The opposite is true if they select a plan with a private pool address. This feature enables a competitive solution and is an instant revenue generator for ISPs.

The IP Upsell feature solves a number of connectivity problems, especially with regard to certain video conferencing and online gaming applications.

You have additional flexibility for configuring up sell scenarios. Users can be assigned WAN's of different bandwidth capabilities; for example, hotel guests with loyalty memberships can qualify for premium services.

Load Balancing

Load balancing is available as an optional module. See "Load Balancing and Link Failover" on page 33 for a more complete description and typical use cases.

Logout Pop-Up Window

As an alternative to the ICC, the NSE delivers a HTML-based pop-up window with the following functions:

- Provides the opportunity to display a single logo.
- Displays the session's elapsed/count-down time.
- Presents an explicit Logout button.

See also, "Information and Control Console" on page 18.

MAC Filtering

MAC Filtering enhances Nomadix' access control technology by allowing system administrators to block malicious users based on their MAC address. Up to 50 MAC addresses can be blocked at any one time. See also, "Session Rate Limiting (SRL)" on page 25.

Multi-Level Administration Support

The NSE allows you to define 2 concurrent access levels to differentiate between managers and operators, where managers are permitted read/write access and operators are restricted to read access only.

Once the logins have been assigned, managers have the ability to perform all write commands (Submit, Reset, Reboot, Add, Delete, etc.), but operators cannot change any system settings. When Administration Concurrency is enabled, one manager and three operators can access the Access Gateway platform at any one time.

Multi-WAN Interface Management

The NSE supports multiple independently configurable WAN interfaces, to optimize ISP resource allocation, and provide load balancing (optional), fail-over and upsell capabilities.

NTP Support

The NSE supports Network Time Protocol (NTP), an Internet standard protocol that assures accurate synchronization (to the millisecond) of computer clock times in a network of computers. NTP synchronizes the client's clock to the U.S. Naval Observatory master clocks.

Running as a continuous background client program on a computer, NTP sends periodic time requests to servers, obtaining server time stamps and using them to adjust the client's clock.

Portal Page Redirect

The NSE contains a comprehensive HTTP page redirection logic that allows for a page redirect **before** (Portal Page Redirect) and/or **after** the authentication process (Home Page Redirect). As part of the Portal Page Redirect feature, the NSE can send a defined set of parameters to the portal page redirection logic that allows an External Web Server to perform a redirection based on:

- Access Gateway ID and IP Address
- Origin Server
- Port Location
- Subscriber MAC address
- Externally hosted RADIUS login failure page

This means that the network administrator can now perform location-specific service branding (for example, an airport lounge) from a centralized Web server.

See also, ““Adding and Updating Port-Location Assignments {Add}” on page 192Home Page Redirect” on page 16.

RADIUS-driven Auto Configuration

Nomadix’ unique RADIUS-driven Auto Configuration functionality utilizes the existing infrastructure of a mobile operator to provide an effortless and rapid method for configuring devices for fast network roll-outs. Once configured, this methodology can also be effectively used to centrally manage configuration profiles for all Nomadix devices in the public access network.

Two subsequent events drive the automatic configuration of Nomadix devices:

1. A flow of RADIUS Authentication Request and Reply messages between the Nomadix gateway and the centralized RADIUS server that specifies the location of the meta configuration file (containing a listing of the individual configuration files and their download frequency status) are downloaded from an FTP server into the flash of the Nomadix device.
2. Defines the automated login into the centralized FTP server and the actual download process into the flash.

Optionally, the RADIUS authentication process and FTP download can be secured by sending the traffic through a peer-to-peer IPSec tunnel established by the Nomadix gateway and

terminated at the NOC (Network Operations Center). See also, "Secure Management" on page 23.

The NSE provides a Radius VSA that supports assigning specific users to specific WAN interface. See "Defining Automatic Configuration Settings {Auto Configuration}" on page 94.

RADIUS Client

Nomadix offers an integrated RADIUS (Remote Authentication Dial-In User Service) client with the NSE allowing service providers to track or bill users based on the number of connections, location of the connection, bytes sent and received, connect time, etc. The customer database can exist in a central RADIUS server, along with associated attributes for each user. When a customer connects into the network, the RADIUS client authenticates the customer with the RADIUS server, applies associated attributes stored in that customer's profile, and logs their activity (including bytes transferred, connect time, etc.). The NSE's RADIUS implementation also handles vendor specific attributes (VSAs), required by WISPs that want to enable more advanced services and billing schemes, such as a per device/per month connectivity fee. See also, "RADIUS Proxy" on page 22.

RADIUS Proxy

The RADIUS Proxy feature relays authentication and accounting packets between the parties performing the authentication process. Different realms can be set up to directly channel RADIUS messages to the various RADIUS servers. This functionality can be effectively deployed to:

- Support a wholesale WISP model directly from the edge without the need for any centralized AAA proxy infrastructure.
- Support EAP authenticators (for example, WLAN APs) on the subscriber-side of the NSE to transparently proxy all EAP types (TLS, SIM, etc.) and to allow for the distribution of per-session keys to EAP authenticators and supplicants.

Complementing the RADIUS Proxy functionality is the ability to route RADIUS messages depending on the Network Access Identifier (NAI). Both prefix-based (for example, *ISP/username@ISP.net*) and suffix-based (*username@ISP.net*) NAI routing mechanisms are supported. Together, the RADIUS Proxy and Realm-Based Routing further support the deployment of the Wholesale Wi-Fi™ model allowing multiple providers to service one location. See also, "RADIUS Client" on page 22.

Realm-Based Routing

Realm-Based Routing provides advanced NAI (Network Access Identifier) routing capabilities, enabling multiple service providers to share a HotSpot location, further supporting

a Wi-Fi wholesale model. This functionality allows users to interact only with their chosen provider in a seamless and transparent manner.

Remember Me and RADIUS Re-Authentication

The NSE's Internal Web Server (IWS) stores encrypted login cookies in the browser to remember logins, using usernames and passwords. This "Remember Me" functionality creates a more efficient and better user experience in wireless networks.

The RADIUS Re-Authentication buffer has been expanded to 720 hours, allowing an even more seamless and transparent connection experience for repeat users.

Secure Management

There are many different ways to configure, manage and monitor the performance and up-time of network devices. SNMP, Telnet, HTTP and ICMP are all common protocols to accomplish network management objectives. And within those objectives is the requirement to provide the highest level of security possible.

While several network protocols have evolved that offer some level of security and data encryption, the preferred method for attaining maximum security across all network devices is to establish an IPSec tunnel between the NOC (Network Operations Center) and the edge device (early VPN protocols such as PPTP have been widely discredited as a secure tunneling method).

As part of Nomadix' commitment to provide outstanding carrier-class network management capabilities to its family of public access gateways, we offer secure management through the NSE's standards-driven, peer-to-peer IPSec tunneling with strong data encryption. Establishing the IPSec tunnel not only allows for the secure management of the Nomadix gateway using any preferred management protocol, but also the secure management of third party devices (for example, WLAN Access Points and 802.3 switches) on private subnets on the subscriber side of the Nomadix gateway. See also, "Defining IPSec Tunnel Settings" on page 177.

Two subsequent events drive the secure management function of the Nomadix gateway and the devices behind it:

1. Establishing an IPSec tunnel to a centralized IPSec termination server (for example, Nortel Contivity). As part of the session establishment process, key tunnel parameters are exchanged (for example, Hash Algorithm, Security Association Lifetimes, etc.).
2. The exchange of management traffic, either originating at the NOC or from the edge device through the IPSec tunnel. Alternatively, AAA data such as RADIUS Authentication and Accounting traffic can be sent through the IPSec tunnel. See also, "RADIUS-driven Auto Configuration" on page 21.

The advantage of using IPSec is that all types of management traffic are supported, including the following typical examples:

- ICMP - PING from NOC to edge devices
- Telnet - Telnet from NOC to edge devices
- Web Management - HTTP access from NOC to edge devices
- SNMP
  - SNMP GET from NOC to subscriber-side device (for example, AP)
  - SNMP SET from NOC to subscriber-side device (for example, AP)
  - SNMP Trap from subscriber-side device (for example, AP) to NOC

Secure Socket Layer (SSL)

This feature allows for the creation of an end-to-end encrypted link between your NSE-powered product and wireless clients by enabling the Internal Web Server (IWS) to display pages under a secure link—important when transmitting AAA information in a wireless network when using RADIUS.

SSL requires service providers to obtain digital certificates to create HTTPS pages. Instructions for obtaining certificates are provided by Nomadix.

Secure XML API

XML (Extensible Markup Language) is used by the subscriber management module for user administration. The XML interface allows the NSE to accept and process XML commands from an external source. XML commands are sent over the network to your NSE-powered product which executes the commands, and returns data to the system that initiated the command request. XML enables solution providers to customize and enhance their product installations.

This feature allows the operator to use Nomadix' popular XML API using the built-in SSL certificate functionality in the NSE so that parameters passed between the Gateway and the centralized Web server are secured via SSL.

If you plan to implement XML for external billing, please contact technical support for the XML specification of your product. Refer to "Contact Information" on page 349.

Session Rate Limiting (SRL)

Session Rate Limiting (SRL) significantly reduces the risk of “Denial of Service” attacks by allowing administrators to limit the number sessions any one user can take over a given time period and, if necessary, then block malicious users.

Session Termination Redirect

Once connected to the public access network, the NSE will automatically redirect the customer to a Web site for local or personalized services if the customer logs out or the customer’s account expires while online and the goodbye page is enabled. In addition, the NSE also provides pre- and post-authentication redirects as well as one at session termination.

Smart Client Support

The NSE supports authentication mechanisms used by Smart Clients by companies such as Adjungo Networks, Boingo Wireless, GRIC and iPass.

SNMP Nomadix Private MIB

Nomadix’ Access Gateways can be easily managed over the Internet with an SNMP client manager (for example, HP OpenView or Castle Rock). See Using an SNMP Manager.

To take advantage of the functionality provided with Nomadix’ private MIB (Management Information Base), to view and manage SNMP objects on your product, see Installing the Nomadix Private MIB.

Static Port Mapping

This feature allows the network administrator to setup a port mapping scheme that forwards packets received on a specific port to a particular static IP (typically private and misconfigured) and port number on the subscriber side of the NSE. The advantage for the network administrator is that free private IP addresses can be used to manage devices (such as Access Points) on the subscriber side of the NSE without setting them up with Public IP addresses.

Tri-Mode Authentication

The NSE enables multiple authentication models providing the maximum amount of flexibility to the end user and to the operator by supporting any type of client entering their network and any type of business relationship on the back end. For example, in addition to supporting the secure browser-based Universal Access Method (UAM) via SSL, Nomadix is the only

company to simultaneously support port-based authentication using IEEE 802.1x and authentication mechanisms used by Smart Clients. MAC-based authentication is also available.

See also:

- Access Control and Authentication
- Smart Client Support

URL Filtering

The NSE can restrict access to specified Web sites based on URLs defined by the system administrator. URL filtering will block access to a list of sites and/or domains entered by the administrator using the following three methods:

- Host IP address (for example, 1.2.3.4).
- Host DNS name (for example, www.yahoo.com).
- DNS domain name (for example, *.yahoo.com, meaning all sites under the yahoo.com hierarchy, such as finance.yahoo.com, sports.yahoo.com, etc.).

The system administrator can dynamically add or remove up to 300 specific IP addresses and domain names to be filtered for each property.

Walled Garden

The NSE provides up to 300 IP passthrough addresses (and/or DNS entries), allowing you to create a “Walled Garden” within the Internet where unauthenticated users can be granted or denied access to sites of your choosing.

Web Management Interface

Nomadix’ Access Gateways can be managed remotely via the built-in Web Management Interface where various levels of administration can be established. See also, “Using the Web Management Interface (WMI)” on page 78.

Weighted Fair Queueing

Weighted Fair Queueing allocates bandwidth to individual users or groups in proportion to their individual or group bandwidth limits. Weighted Fair Queueing provides a fall-back in an over-subscribed scenario.

In NSE 8.5, Class Based Queueing and Weighted Fair Queueing are mutually exclusive. Weighted Fair Queueing is enabled by default.

Example Scenario

Your facility has a 150 Mbps internet connection. You have 100 subscribers with a basic plan with 1M up/down bandwidth limits, and 100 subscribers with a premium plan with 2M up/down speeds

At full capacity, your 200 subscribers will consume 300 Mbps. However, the total available bandwidth is only 150 Mbps.

When WFQ is ON, the premium subscribers will get a total bandwidth of 100 MB. And regular subscribers will get a total bandwidth of 50MB only. The ratio of bandwidth utilization between the premium subscribers and regular subscribers remains 2:1.

Optional NSE Modules

Load Balancing

Load Balancing requires an optional NSE product license

With the Load Balancing Module, Internet traffic is balanced across multiple WAN/ISP connections to ensure that traffic is distributed based on the capability of each connection. For example, organizations may wish to balance traffic between a low-cost DSL WAN/ISP and one high-performance, high-capacity WAN/ISP. This is of value when multiple links are used to optimize cost for Internet service, such as balancing traffic between one low-cost DSL WAN/ISP and one high-performance, high-capacity WAN/ISP. Hotels may also use this capability to provide tiered services reflecting the capacity of the WAN/ISP connection.

The Link Failover feature of the Load Balancing Module is designed to improve business continuity. In the event that one or more links fail, traffic is seamlessly rerouted to the remaining surviving links without lapse of service. When the failed links recover, the NSE routes new connections toward the now-working links until a normal, balanced configuration is reached.

For details of the Load Balancing capabilities and sample use cases, see "Load Balancing and Link Failover" on page 33.

Hospitality Module

The optional Hospitality Module provides the widest range of Property Management System (PMS) interfaces to enable in-room guest billing for High Speed Internet Access (HSIA) service. This module also includes 2-Way PMS interface capability for in-room billing in a Wi-Fi enabled network. In addition, the Hospitality Module includes the Bill Mirror functionality for posting of billing records to multiple sources. With this module, the NSE also supports billing over a TCP/IP connection to select PMS interfaces.

PMS Integration

Your product license may not support this feature.

Some Property Management Systems may require you to obtain a license before integrating the PMS with the Access Gateway. Check with the PMS vendor.

By integrating with a hotel's PMS, your NSE-powered product can post charges for Internet access directly to a guest's hotel bill. In this case, the guest is billed only once. The NSE outputs a call accounting record to the PMS system whenever a subscriber purchases Internet service and decides to post the charges to their room. Nomadix' Access Gateways are equipped with a serial PMS interface port to facilitate connectivity with a customer's Property Management System.

High Availability Module

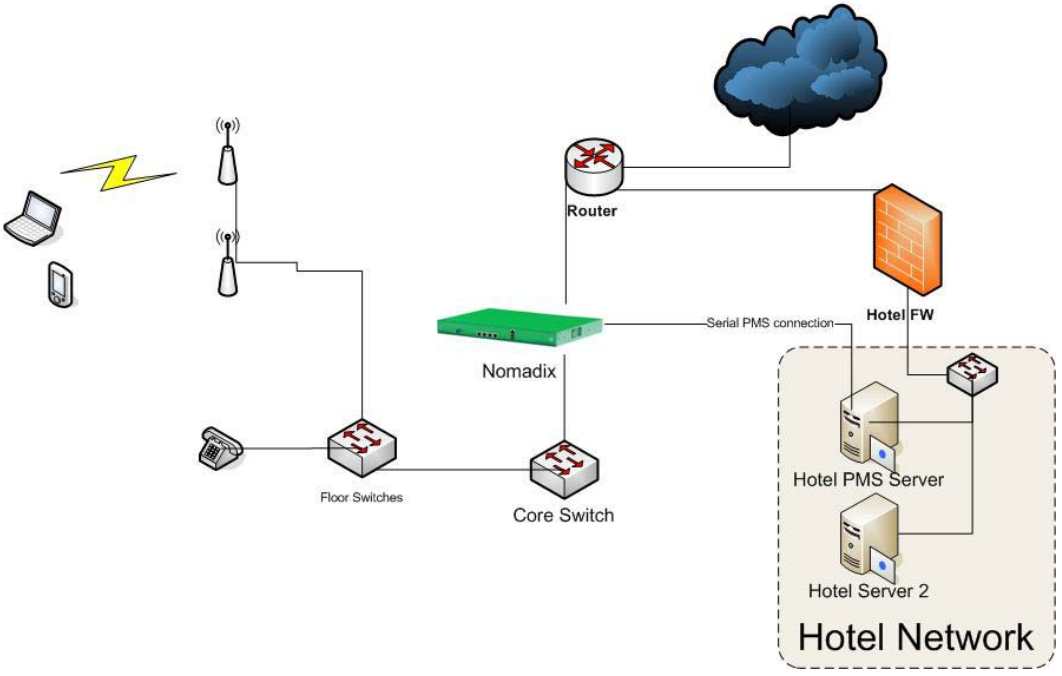
Your product license may not support this feature.

The optional High Availability Module offers enhanced network uptime and service availability when delivering high-quality Wi-Fi service by providing Fail-Over functionality. This module allows a secondary Nomadix Access Gateway to be placed in the network that can take over if the primary device fails, ensuring Wi-Fi service remains uninterrupted.

Network Architecture (Sample)

The Access Gateway can be deployed effectively in a variety of wireless and wired broadband environments where there are many users—usually mobile—who need high speed access to the Internet.

The following example shows a potential Hospitality application:



Multiple Unit Clustering

In the recent past, it was necessary to segment the network to serve a number of subscribers that exceed the user count on a Nomadix gateway. Now with clustering all subscribers can be on the same segment, as the subscribers are distributed across multiple gateways. A large number of subscribers can be distributed to as many as 250 gateways, thus providing a design capacity of 1 million subscribers being served.

One can scale the cluster up and down just by adding gateways or removing gateways. Remember that a subscriber and the subscriber's MAC address are positioned in a specific gateway, so changing the number of gateways will require the gateways to reconfigure, and their current subscriber table updated. If a prepaid subscriber exists in a radius or authentication file, this prepayment will be lost. It is recommended that prepayment situations should be avoided.

The cluster will distribute the subscribers MAC addresses according to a modulus calculation based on the last three bytes of the MAC address of the subscriber. The result will determine which gateway will support that MAC address while the other gateways ignore the traffic for the MAC.

There is currently no failover in support of clustering. The following other NSE features are not compatible with clustering:

- Proxy ARP for device
- Routed subscribers
- Intra-port communication

Identifying the Resident Gateway in a Cluster Environment

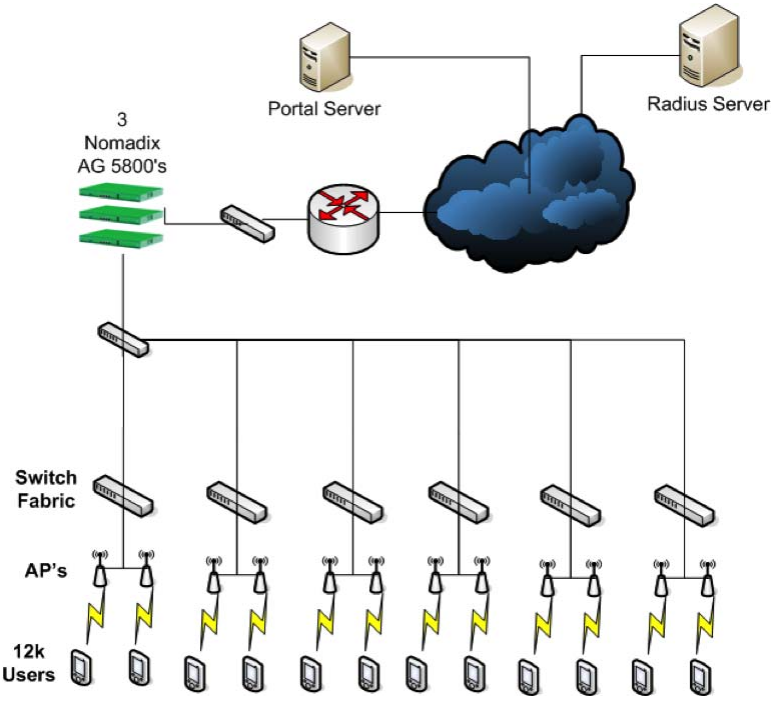
To diagnose device connection problems in a cluster environment, you must identify the resident gateway. For a given MAC address, you can determine the gateway as follows. You will need the last three bytes of the device MAC address and the total number of gateways.

Convert the hex bytes to decimal:

1. Using the Windows Calculator in programmer mode
2. In hex mode, input the last three bytes of the MAC address
3. Convert to decimal by using that function on the calculator

The resident gateway is the (decimal bytes) modulus (the total number of gateways), plus 1.

The following graphic illustrates a clustering scenario with 12,000 users and three gateways.



Load Balancing and Link Failover

The NSE supports individual configuration of multiple WANs on an Access Gateway (supported on AG2400, AG5600, and AG5800 hardware). Hotels can use this capability in a number of ways, including load balancing, failure protection, and subscriber allocation.

This section provides use cases and scenarios to help you consider the full advantage of these capabilities.

Definitions and Concepts

Load Balancing

Load balancing refers to the general process of balancing user traffic across multiple ISP connections. All load-balancing appliances, as well as the Nomadix NSE, support load balancing.

Link Aggregation

Link aggregation refers to the process of connecting multiple ISP connections to an appliance and having the sum of all of the ISP bandwidth available to be shared across all users. However, one individual connection is limited to the speed of the ISP connection that is currently being used. For example, a hotel may aggregate 5 x 1.5Mbps DSL connections together. This means that a total of 7.5Mbps of bandwidth is available to be shared across all users, but a single user can receive a maximum of 1.5Mbps. All load-balancing appliances, as well as the Nomadix NSE, support link aggregation. In most cases, link aggregation and load balancing is effectively the same thing.

Link Failover

Link failover (sometimes referred to ISP redundancy) is the process of providing a second (or occasionally a third or more) ISP link as a back up to the primary ISP link. In the event that the primary link fails, all traffic is re-routed to the backup link, until such time as the primary link becomes available.

Combined Load Balancing and Link Failover

This is the process where both load balancing and link failover are combined together. It represents the best of both worlds. Where multiple ISP links are used in load balancing mode, in the event that one or more links fail, all traffic is automatically rerouted to the remaining surviving links. When the failed links recover, new connections are routed toward these until the normal balanced configuration is reached.

ISP link Selection Criteria

In a load-balancing scenario, some criteria must be used to decide which ISP is selected for outgoing traffic. There a number of factors that influence this decision, including:

- Identity of the users: Is a random ISP section used or is it desirable to have certain users steered toward a particular ISP?
- For random ISP: Whether subscriber, destination address or session-based link selection is used?

User-Based ISP Selection versus Random ISP Selection

User-based ISP selection is the process whereby the ISP link that is selected in a load-balanced environment is based on the identity of the user. For example, all users from guest rooms may be steered toward one ISP link, and all meeting room users steered toward another ISP link that is only used for meetings and conferences.

The alternative is to use random ISP selection, whereby the load balancer or NSE selects the ISP to be used according to the current load conditions. The Nomadix NSE uses random ISP selection by default.

Link Availability Detection Method and Time

Load balancing and failover requires some form of monitoring of each ISP link to determine its availability for executing load balancing and failover decisions. Generally, link monitoring is accomplished by two different methods:

1. Periodic probing of predefined hosts using HTTP or ICMP ping requests.
2. Periodic DNS queries to the DNS servers provided by each ISP.

The period between successive link tests is usually configured, and is typically set to between 30 seconds and 60 seconds. This represents the maximum time for which a user will remain connected to a failed ISP connection before being re-routed to a working ISP link in an ISP failure scenario.

Traffic Balancing and Weighting

Load balancers have some form of weighting of traffic between links to achieve a desired balance scenario. With the Nomadix NSE, traffic is balanced by individual subscriber numbers, and weighted according to the speed of the ISP connected to each port. For example, if an NSE has 2 x 10M links connected and currently has 100 active subscribers, then 50 users would be connected to each link. If the ISP links were 10 Mbps and 40Mbps, then 20 users would be connected to the 10M link and 80 users to the 40M link, and so on.

Load Rebalancing upon Link Recovery

Load balancing and failover with well-configured link availability detection provides fast and effective recovery from ISP link failure occurrences. Additional consideration must be made as to what actions should be taken when a failed ISP link recovers. The Nomadix approach is to rebalance as the ISP links change, thus making sure the maximum level of service is always provided. There is a small yet important waiting time to ensure changing links is kept to a minimum.

Load Balancing and Failure Considerations

1. Is load balancing or just ISP failover required?
2. Is aggregation of multiple low-speed links required?
3. How reliable are different local ISP services?
4. What are the relative costs of different ISP services?
5. Do ISP links need to be shared between guest and back-office users?
6. Is there a requirement to have certain users connected to a particular ISP?

1. It may be a requirement to provide just a backup service to the primary ISP service in the case that the main HSIA ISP fails. The backup service may be on a pay-to-use basis through a 3G or 4G wireless modem, or be a low-cost, lower-tier service, such as a cable modem service, that is only used when the main ISP link is down, on the basis that providing a reduced HSIA service is better than no service at all when the main ISP link is down. Alternatively, the organization may have multiple ISP links, and wants to be able to fully utilize all of them under normal conditions. The Nomadix NSE supports both failover only and combined load balancing with failover.

2. In some instances, suitable high-speed internet services required to meet the aggregate needs of the organization may not be available or are simply too expensive. In this case it may be desirable to aggregate multiple lower-cost, lower-speed lines together. The Nomadix AG2400 and AG5600 can aggregate services from up to three ISP links, and the AG5800 can handle up to five links.

3. It is important to consider the relative quality of each ISP link. If a second link is much lower quality than the main ISP link, then it should only be used as a back-up link in failover mode, and not in a load-balanced environment. If the quality of the links is much the same, then load balancing with failover should be used.

4. It is important to consider the relative cost of links. If all links have a fixed monthly charge, then ideally they should be used in a load-balanced mode, so that costly links are not sitting unused most of the time. But if an ISP link has a relatively low monthly charge with high per-megabyte data usage charges, then it should only be used in failover mode as a backup to a main ISP link.

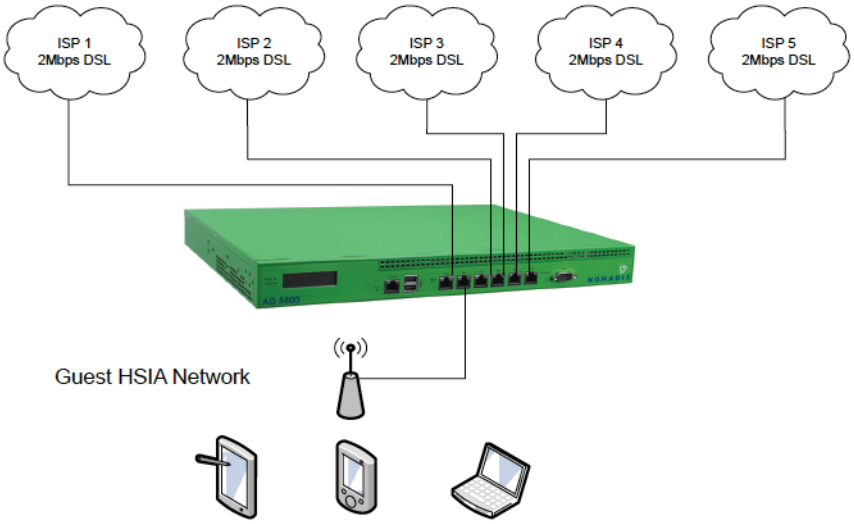
5. It may be requirement to share ISP bandwidth between Guest HSIA and Hotel Admin networks, or have each network available as a fall-back network for the other. Both scenarios can be handled with the Nomadix NSE.

6. It may be desirable to have certain users connected to a particular ISP link, and other users connected to a different ISP link. The Nomadix NSE provides a “preferred WAN” radius attribute (VSA). For example, paying users may be connected to an expensive high-quality link, with free users connected to a lower-quality link, with link failover still available if the preferred link fails.

Some examples of typical common deployment scenarios are outlined below: These are just examples and other deployment scenarios can be handled, as well.

Load Balancing across Multiple Low Speed Links

In this example, an establishment has access to only low-speed, DSL-based ISP circuits and wishes to aggregate five such links together. The Nomadix NSE is configured with load balancing between all links.

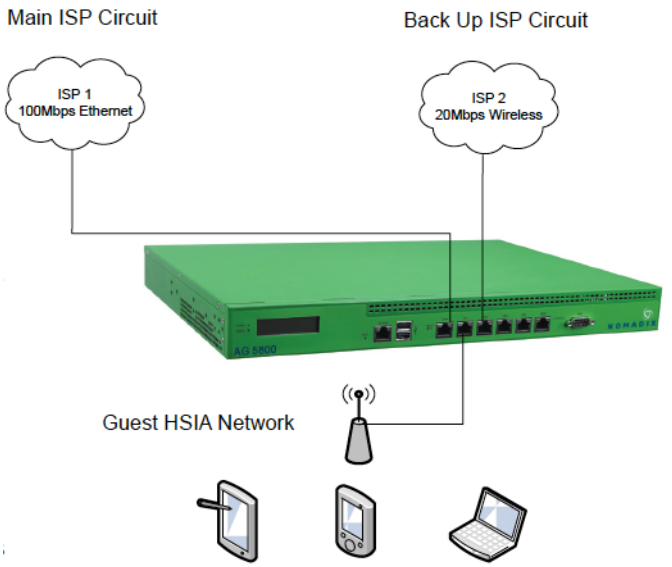


Failover to Standby ISP Link

In this example, the organization has a high-quality 100M Ethernet service. But to guarantee continuous HSIA service, the organization has a back-up ISP service from a low-cost wireless

provider, which charges on a data volume basis. The organization only wishes for this link to be used when the main ISP circuit is not available.

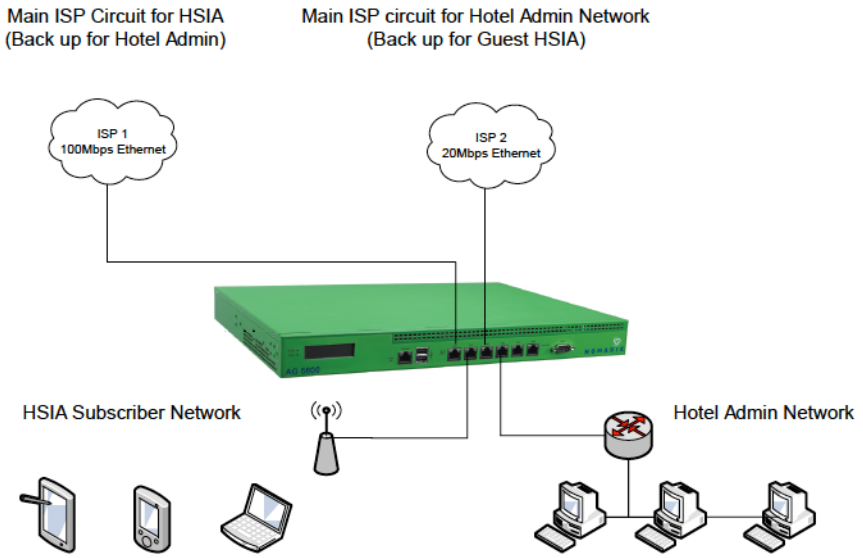
The Nomadix NSE is configured for failover only from the WAN to port Eth2 on the NSE.



Separate Guest HSIA and Admin ISP Links, with Failover Between Each ISP Link

In this scenario, the hotel has separate HSIA and Hotel Admin ISP circuits. Under normal circumstances, Guests will be connected to the Guest HSIA ISP, and Hotel Admin users will connect to the Admin ISP. If either link fails, then failover to the other link will occur. If the Guest HSIA link fails, the guests will be connected to the Admin ISP link until the Guest HSIA link is restored. If the Admin ISP link fails, the Admin users will be connected to the Guest HSIA link until the Admin ISP is restored

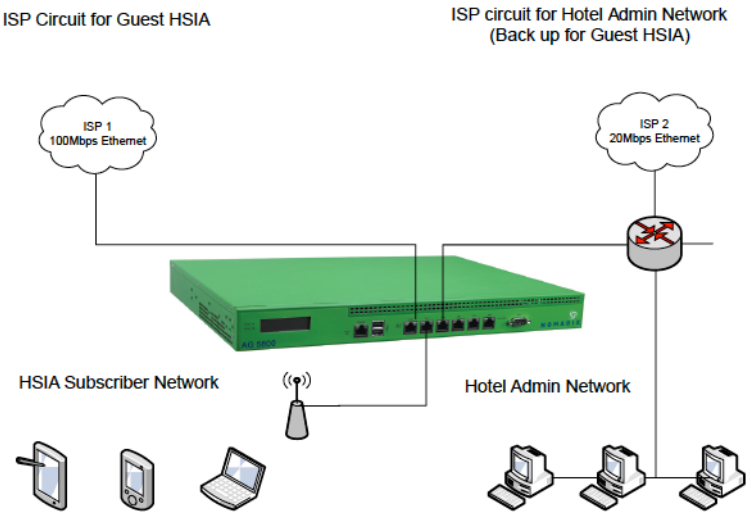
The Nomadix NSE is configured with load balancing and failover. All Guests use ISP 1 as the preferred WAN, the Admin network router uses ISP2 as the preferred WAN.



Guest HSIA Failover Only, to Admin Network

In this scenario, the hotel has separate ISP circuits for the Guest HSIA network and Hotel Admin network. The hotel wants the Admin network to be available as a back-up link in case the Guest HSIA ISP link fails. There is no back-up for the Admin ISP network.

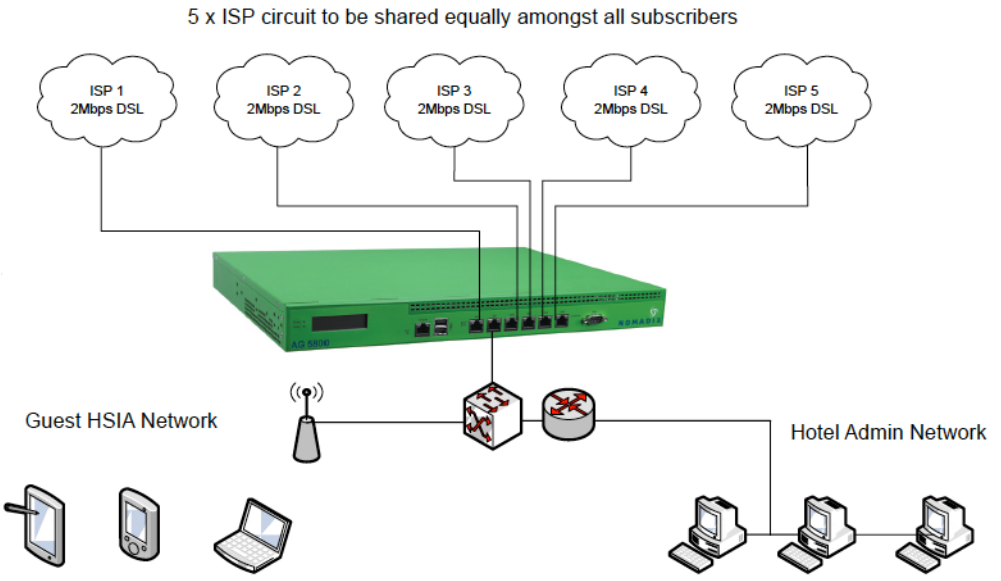
The Nomadix NSE is configured with link failover between the WAN port and port ETH2, which is connected to the hotel Admin network router.



Sharing Guest HSIA Network and Hotel Admin Network Among Multiple ISP Links

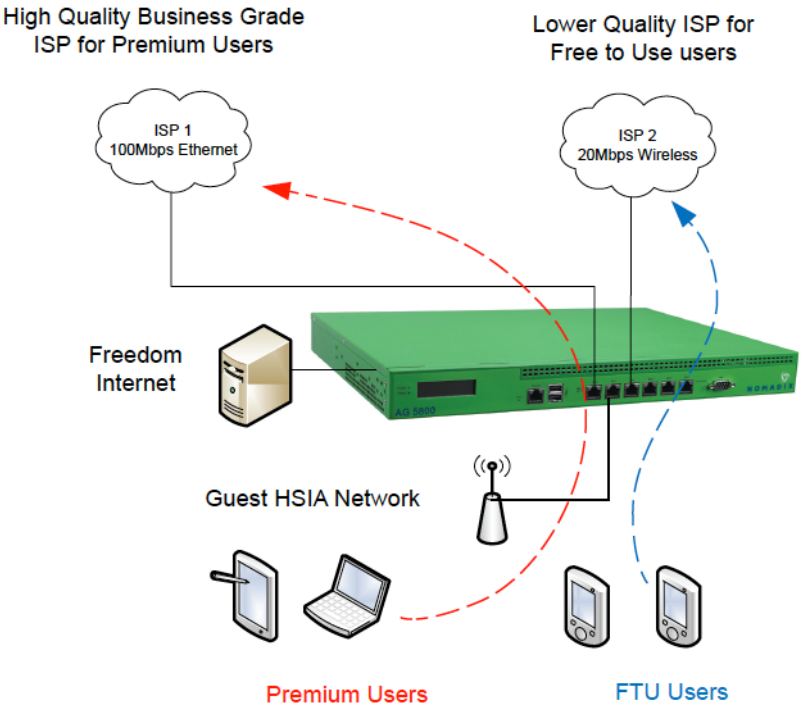
In this scenario, multiple ISP links are connected to the Nomadix NSE, in a similar method to the first scenario, but both the guest HSIA network and the Hotel Admin network are connected to the NSE and share the aggregate bandwidth of the combined ISP links.

The Nomadix NSE is configured for load balancing, and the back office router's MAC address is registered in as a device in the NSE with an appropriate bandwidth limit.



Load Balancing With Users Connected to a Preferred ISP Link

In this scenario the hotel has purchased 2 x ISP links for guest HSIA. One is a high-quality, high-cost "business grade" ISP circuit, and the other is a low-cost, lower-grade domestic service provided by the local cable TV operator. The hotel has a number of bill plan options including free-to-use and pay-to-use premium plans. Under normal circumstances, the hotel wants guests who have selected a free plan to use the low-cost link, and guests who have selected a premium service to use the higher-cost, business-grade ISP connection. If either link fails, guest should fail over to the other links until the preferred link is restored.


High Quality Business Grade
ISP for Premium Users
Lower Quality ISP for
Free to Use users
ISP 1
100Mbps Ethernet
ISP 2
20Mbps Wireless
Freedom
Internet
Guest HSIA Network
Premium Users
FTU Users

Online Help (WebHelp)

The Access Gateway incorporates an online Help system called “WebHelp” which is accessible through the Web Management Interface (when a remote Internet connection is established following a successful installation). WebHelp can be viewed on any platform (for example, Windows, Macintosh, or UNIX-based platforms) using either Internet Explorer or Netscape Navigator (see note).

WebHelp is useful when you have an Internet connection to the Access Gateway and you want to access information quickly and efficiently. It contains all the information you will find in this User Guide.

For more information about WebHelp and other online documentation resources, go to “Online Documentation and Help” on page 59.

Notes, Cautions, and Warnings

The following formats are used throughout this User Guide:

General notes and additional information that may be useful are indicated with a Note.

Cautions and warnings are indicated with a Caution. Cautions and warnings provide important information to eliminate the risk of a system malfunction or possible damage.

Installing the Access Gateway

This section provides installation instructions for the hardware and software components of the Access Gateway. It also includes an overview of the management interface, some helpful hints for system administrators, a Quick Reference Guide, and procedures.

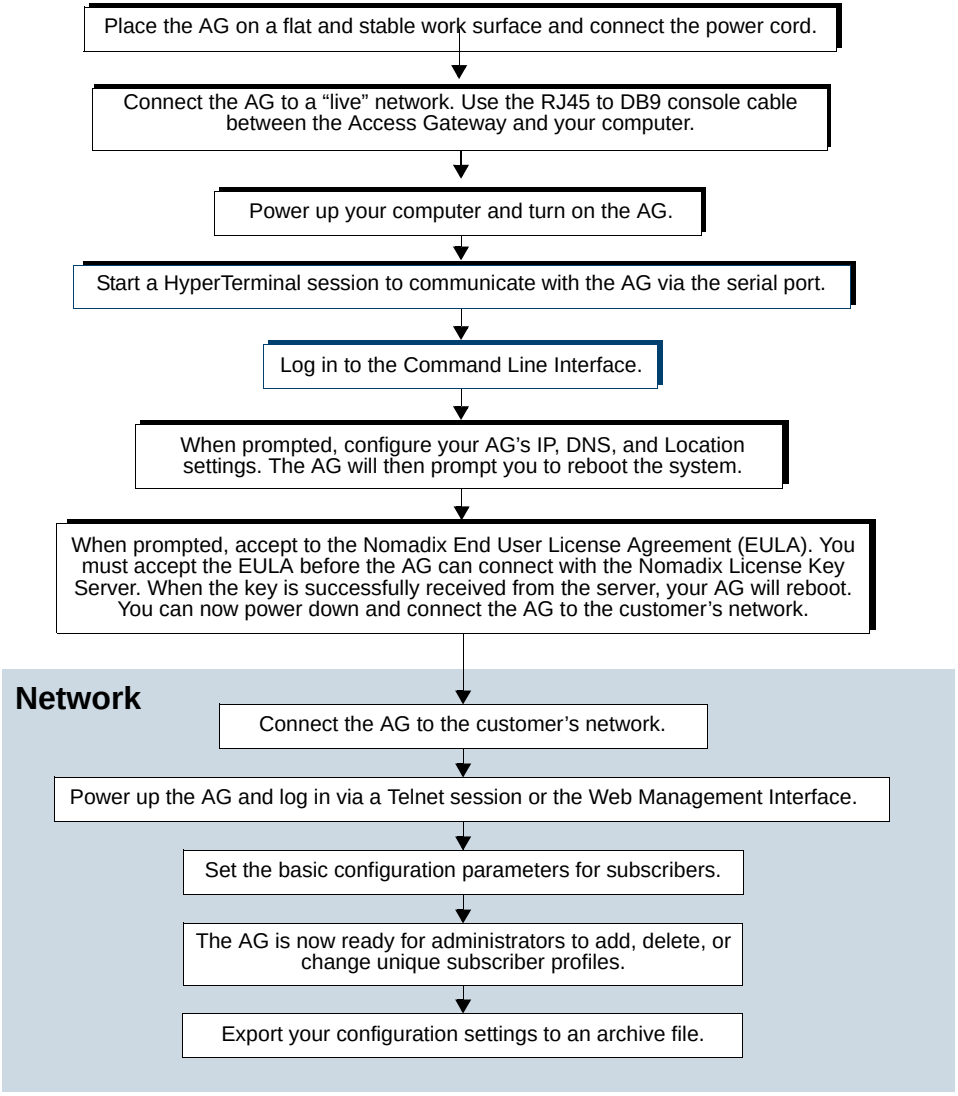
Once you have installed your Access Gateway and established the configuration settings, you should write the settings to an archive file. If you ever experience problems with the system, your archived settings can be restored at any time. See *"Archiving Your Configuration Settings" on page 75*.

Nomadix Access Gateway

Installation Workflow

The following flowchart illustrates the steps that are required to install and configure your Access Gateway successfully. Review the installation workflow before attempting to install the

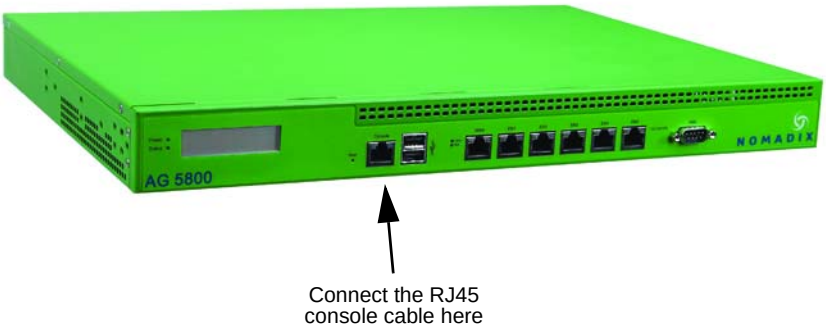
Access Gateway on the customer's network.


Place the AG on a flat and stable work surface and connect the power cord.
Connect the AG to a "live" network. Use the RJ45 to DB9 console cable between the Access Gateway and your computer.
Power up your computer and turn on the AG.
Start a HyperTerminal session to communicate with the AG via the serial port.
Log in to the Command Line Interface.
When prompted, configure your AG's IP, DNS, and Location settings. The AG will then prompt you to reboot the system.
When prompted, accept to the Nomadix End User License Agreement (EULA). You must accept the EULA before the AG can connect with the Nomadix License Key Server. When the key is successfully received from the server, your AG will reboot. You can now power down and connect the AG to the customer's network.
Network
Connect the AG to the customer's network.
Power up the AG and log in via a Telnet session or the Web Management Interface.
Set the basic configuration parameters for subscribers.
The AG is now ready for administrators to add, delete, or change unique subscriber profiles.
Export your configuration settings to an archive file.

Powering Up the System

Use this procedure to establish a direct cable connection between the Access Gateway and your laptop computer, and to power up the system.

1. Place the Access Gateway on a flat and stable work surface.
2. Connect the power cord.
3. Connect the RJ45 console cable between the Access Gateway's Console port and the female DB9 to the serial port or USB to serial adapter of your computer.
4. Turn on your computer and allow it to boot up.
5. Turn on the Access Gateway.



User Manual and Documentation

The Nomadix product user manuals, product documentation and support files including MIB, XML DTD and sample dictionary files are located at the following URL:

http://www.nomadix.com/current_releases.php

If you have any problems, please contact our technical support team at +1.818.575.2590, or email: support@nomadix.com.

This quick start document provides instructions and reference material for getting started with the Nomadix Access Gateway products, specifically the AG 2400 and AG 5800.

Accessory Box Contents

AG 2400

1 – U.S. (NEMA 5-15p) Power Cord

1 – EU (Schuko CEE7/7) Power Cord

1 – 6’ RJ45 – DB9 Console Cable

2 – Rack Mount Brackets and PS bracket

1 – Bumper and Screw Kit

AG 5800

1 – U.S. (NEMA 5-15p) Power Cord

1 – EU (Schuko CEE7/7) Power Cord

1 – 6’ RJ45 – DB9 Console Cable

2 – Rack Mount Brackets

1 – Bumper and Screw Kit

Start Here

1. Unpack the Nomadix Access Gateway and place the product on a flat and stable work surface.
2. Register the gateway for support services by completing and returning the Nomadix Gateway Registration Form; hardcopy enclosed or obtain the form online at http://www.nomadix.com/registration.
3. Connect the power cord.
4. Connect to the Access Gateway (AG). There are two ways to connect to the Access Gateway (AG):
   - Serial Connection:

   Connect the RJ45 console cable to the product’s console port and the DB9 female to your computer.

Start a HyperTerminal (or equivalent) session to communicate with the AG via the product's console interface. Use the following configuration settings for your session:

Bits per Second	Data Bits	Parity	Stop Bits	Flow Control
9600	8	None	1	None

- Subscriber-side Ethernet Connection:

Connect an Ethernet cable between the product's **Eth1** port and your computer's Ethernet port.

5. Setup a SSH client to establish a SSH session to communicate with the NSE gateway via the administrative IP address after the Access Gateway finishes powering up. The administrative IP address is 172.30.30.172.

IP Address	172.30.30.173
Netmask	255.255.0.0
Gateway	172.30.30.172
DNS (If Required)	4.2.2.1

6. Power up your computer and turn on the product. You can then configure the WAN for a static IP address, DHCP Client or PPPoE client using appropriate configuration guidelines that follow in order to obtain the license key. Once the key has been obtained, the web management interface (WMI) can be used to continue configuration.

LCD Messages

Some Access Gateway hardware models are equipped with an LCD panel, that displays the following system information:

- Platform and Firmware Version Installed
- Primary IP Address of the NSE
- NSE ID
- Active Subscribers.

Configuration

Note: The WAN port of the AG must be connected to a live network that can access the Internet in order to retrieve the license key from the license key server.

Log in by typing **admin** then password: **admin**. Type (**y**)es when prompted to configure settings. The initial minimal WAN port configuration mode will be displayed as shown in Figure 1.

```
Ready.  Press enter to login.
NSE
Login: admin <Enter>
Password: ***** <Enter>

NO LICENSE KEY HAS BEEN ENTERED.  A LICENSE KEY MUST BE ENTERED
IN ORDER TO PROCEED WITH INSTALLATION.
SEE USER'S GUIDE FOR LICENSE KEY INFORMATION.

INSTALLATION WILL NOW TRY TO CONTACT THE NOMADIX LICENSE KEY SERVER.
IN ORDER TO PROCEED, THE NSE MUST BE ABLE TO CONNECT TO THE INTERNET.

DO YOU WANT TO CONFIGURE THE NSE'S IP AND DNS SETTINGS? [yes/no]: y

Configuring minimal WAN interface connectivity parameters:
Configuration Mode         [static]      (static, dhcp, pppoe) :
```

Figure 1: Initial minimal WAN port configuration.

Select the desired configuration mode and use the following steps to configure the WAN port for either Static IP, DHCP client or PPPoE.

Step 1a: Static WAN IP Configuration

Accept **static** as the default configuration mode and enter the following **mandatory** settings shown in Figure 2.

```
Configuring minimal WAN interface connectivity parameters:
Configuration Mode [static ] (static, dhcp, pppoe) :
IP Address [10.0.0.10 ] : Your WAN IP address
```

```
Subnet Mask [255.255.255.0 ] : Your subnet mask
Gateway IP [10.0.0.1 ] : Your gateway IP address
WAN 802.1Q tagging [Disabled ] :
VLAN ID [1 ] :
DNS Domain Name [nomadix.com ] :
DNS Server 1 [0.0.0.2 ] : Your primary DNS IP
DNS Server 2 [0.0.0.0 ] :
DNS Server 3 [0.0.0.0 ] :
```

Figure 2: Initial WAN port settings

A WAN port summary page will then be displayed as shown in Figure 3.

```
Port Name : WAN
Port Role : wanIf
Configuration Mode : static
IP Address : Your IP address
Subnet Mask : Your subnet mask
Gateway IP : Your gateway IP addrss
WAN 802.1Q tagging : Disabled
VLAN ID : 1
DNS Domain Name : nomadix.com
DNS Server 1 : Your primary DNS IP address
DNS Server 2 :
DNS Server 3 : 0.0.0.0
Additional NAT IP addresses : Disabled
show all - Show all WAN Interface configuration
show interface <name> - Show a single WAN Interface configuration
modify interface <name> - Modify a single WAN Interface
configuration
Type b to go back, <esc> to abort, ? for help.
Ethernet port/WAN interface configuration>
```

Figure 3: WAN port static IP configuration summary page.

If everything is correct in the summary, type (**b**)ack to return to the previous menu, and proceed to Step 2 to enter the location information.

Otherwise, select an option from the Ethernet port configuration menu to display or make changes to the WAN port settings. When finished with the settings, type **b**(ack) to return to the previous menu, and go to Step 2.

Step 1b: DHCP Client Configuration

Type (**d**)hcp for the configuration mode as shown in Figure 4.

```
Configuring minimal WAN interface connectivity parameters:
Configuration Mode [static ] (static, dhcp, pppoe) : d
WAN 802.1Q tagging [Disabled ] :
VLAN ID [1 ] :
DNS Server 3 [0.0.0.0 ] :
```

Figure 4: Selecting DHCP Client for WAN configuration.

A WAN port summary page will then be displayed as shown in Figure 5.

```
Port Name : WAN
Port Role : wanIf
Configuration Mode : dhcp
IP Address : Your IP address
Subnet Mask : Your subnet mask
Gateway IP : Your gateway IP addrss
WAN 802.1Q tagging : Disabled
VLAN ID : 1
DNS Domain Name : Your domain name
DNS Server 1 : Your primary DNS IP address
DNS Server 2 :
DNS Server 3 : 0.0.0.0
Additional NAT IP addresses : Disabled
show all - Show all WAN Interface configuration
show interface <name> - Show a single WAN Interface configuration
modify interface <name> - Modify a single WAN Interface configuration
Type b to go back, <esc> to abort, ? for help.
Ethernet port/WAN interface configuration>
```

Figure 5: WAN port DHCP client configuration summary page.

If everything is correct in the summary, type (**b**)ack to return to the previous menu, and proceed to step 2 to enter location information.

Otherwise, select an option from the Ethernet port configuration menu to display or make changes to the WAN port settings. When finished with settings, type **b**(ack) to return to the previous menu, and go to step 2.

Step 1c: PPPoE Dynamic IP Client Configuration

Enter (**p**)ppoe when prompted. Enter the following **mandatory** settings for a PPPoE connection with dynamic PPP IP configuration shown in Figure 6.

```
Configuring minimal WAN interface connectivity parameters:
Port Role [wanIf ] (outOfService, subscriberIf, w
anIf) :
Configuration Mode [static ] (static, dhcp, pppoe) : p
PPPoE Service Name [ ] : ("none" to clear) : Your Service
LCP Echo-Request Interval [30 ] :
Maximum LCP Non-responses [6 ] :
PPP Authentication User Name [ ] : ("none" to clear) : Your User Name
PPP Authentication Password [ ] : ("none" to clear) : Your Password
PPP IP Configuation Mode [dynamic ] (dynamic, static) :
PPP Static IP Address [0.0.0.0 ] :
PPP Maximum TCP MSS [1452 ] :
WAN 802.1Q tagging [Disabled ] :
VLAN ID [1 ] :
DNS Domain Name [nomadix.com ] :
DNS Server 3 [0.0.0.0 ] :
```

Figure 6: Selecting PPPoE with dynamic IP configuration.

A WAN port summary page will then be displayed as shown in Figure 7.

```
Port Name : WAN
Port Role : wanIf
Configuration Mode : pppoe
IP Address : Your IP address
Subnet Mask : Your subnet mask
Gateway IP : Your gateway
PPPoE Service Name : Your Service Name
LCP Echo-Request Interval : 30
Maximum LCP Non-responses : 6
PPP Authentication User Name : Your user name
PPP Authentication Password : Your password
PPP IP Configuation Mode : dynamic
PPP Static IP Address : 0.0.0.0
PPP Maximum TCP MSS : 1452
WAN 802.1Q tagging : Disabled
VLAN ID : 1
DNS Domain Name : Your domain name
```

```
DNS Server 1 : Your dns server IP address
DNS Server 2 : 0.0.0.0
DNS Server 3 : 0.0.0.0
Additional NAT IP addresses : Disabled
show all - Show all WAN Interface configuration
show interface <name> - Show a single WAN Interface configuration
modify interface <name> - Modify a single WAN Interface configuration
Type b to go back, <esc> to abort, ? for help.
Ethernet port/WAN interface configuration>
```

Figure 7: WAN port PPPoE client configuration summary page.

If everything is correct in the summary, type (**b**)ack to return to the previous menu, and proceed to step 2 to enter location information.

Otherwise, select an option from the Ethernet port configuration menu to display or make changes to the WAN port settings. When finished with settings, type **b**(ack) to return to the previous menu, and go to step 2.

Step 1d: PPPoE Static IP Client Configuration

Use the same steps for configuring dynamic PPPoE shown in Figure 6 above, but select **static** for *PPP IP Configuration Mode,* and enter **your IP address** for *PPP Static IP Address*. A summary page similar to Figure 7 above will be displayed.

If everything is correct in the summary, type (**b**)ack to return to the previous menu, and proceed to step 2 to enter location information.

Otherwise, select an option from the Ethernet port configuration menu to display or make changes to the WAN port settings. When finished with settings, type **b**(ack) to return to the previous menu, and go to step 2.

Step 2: Entering Your Location Information

You will be required to enter location information in order to obtain the license key. Enter the following **mandatory** location information details shown in Figure 8.

```
Ethernet port/WAN interface configuration>b
Please enter your Company Name [ ]: Your company name
Please enter your Site Name [ ]: Your site name
Please enter your Address (Line 1) [ ]:
(Line 2) [ ]:
```

```
(City) [ ]: Your site city
(State) [ ]: Your site state
(ZIP/Postal Code) [ ]:
(Country) [ ]: Your site country
Please enter your E-Mail Address [ ]: email address
Please select the venue type that most reflects your location
1. Apartment
...
25. Other
Please enter a number from the above list: Venue Type
```

Figure 8: Site location details.

Step 3: Retrieving Your License Key

The system will now prompt you to accept or decline the End User License Agreement (EULA). You must accept the terms of the EULA before the AG can retrieve its license key. To retrieve the license key, enter (**y**)es as shown in Figure 9. The AG retrieves the license key from the Nomadix license key server, then reboots.

```
PLEASE READ THE NOMADIX END USER LICENSE AGREEMENT ('AGREEMENT') INCLUDED
WITH THE NOMADIX PRODUCT.
BY USING THIS SOFTWARE, YOU INDICATE YOUR ACCEPTANCE OF THE AGREEMENT.
I AGREE TO THE TERMS AND CONDITIONS OF THE NOMADIX END USER LICENSE
AGREEMENT.
(Y)ES (N)O
y
The system will now try to contact the Nomadix License Key Server.
Please wait...
Received key from License Key Server.
If the license key is successfully processed the unit will reboot...
```

Figure 9: License key retrieval

NOTE: The date and time Software License Subscription start date.

Step 4: Configuring the System

You have now established a basic configuration for the AG that enables internet connectivity.

Before you can log into the AG and use the graphical Web Management Interface (WMI), you must disable subscriber-side HTTP:

1. Log in to the AG
2. Navigate to **`Configuration`** -> **`Access Control`** -> **`Interface`**
3. Press Enter until you reach **`Subscriber-side HTTP`**
4. Enter **`disabled`**

You can now use the graphical Web Management Interface (WMI) to configure the product's features.

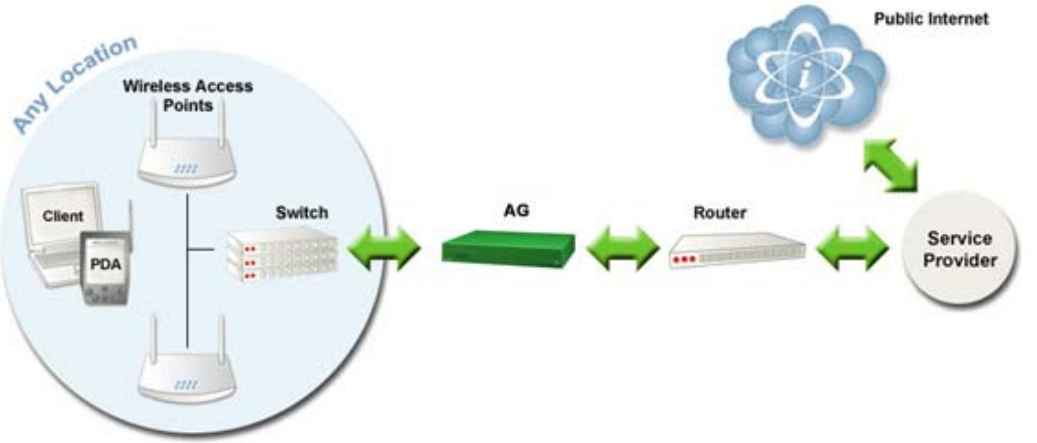
Step 5: Configuring AG DHCP Server Settings

DHCP Server is enabled by default. To configure the DHCP Server, go to DHCP under the Configuration menu. You can either modify the default DHCP pool or delete/add another DHCP pool. The total lease pool size recommendation is 5 times more than the number of licensed subscribers.

DHCP Parameter	Your Settings	Default Values
DHCP Services (Disable)		no
DHCP Relay (Yes / No) If No, skip to DHCP Server		no
DHCP Relay Server IP Address		blank
DHCP Relay Agent IP Address		blank
DHCP Server (Yes / No) Only if the DHCP Relay is disabled		yes
DHCP Server IP Address		10. 0. 0.4
DHCP Server Subnet Mask		255.255.255.0
DHCP Pool Start IP Address		10.0.0.12

DHCP Parameter	Your Settings	Default Values
DHCP Pool End IP Address		10.0.0.72
DHCP Lease Minutes		1440

An example of a basic network including an AG is shown below.



The Management Interfaces (CLI and Web)

The Access Gateway supports various methods for managing the system remotely. These include, an embedded graphical Web Management Interface (WMI), an SNMP client, or Telnet. However, until the unit is installed and running, system management is performed from the Access Gateway's embedded CLI via a direct serial cable connection. The CLI can also be accessed remotely.

Until the unit is installed on the customer's network and a remote connection is established, the CLI is the administrator's window to the system. This is where you establish all the Access Gateway start-up configuration parameters, depending on the customer's network architecture.

The *Access Gateway Menu* is your starting point. From here, you access all the system administration items from the 5 (five) primary menus available:

- Configuration

- Network Info
- Port-location
- Subscribers
- System

Although the basic functional elements are the same, the CLI and the WMI have some minor content and organizational differences. For example, in the WMI the "subscribers" menu is divided into "Subscriber Administration" and "Subscriber Interface." See also, "Menu Organization (Web Management Interface)" on page 56.

Making Menu Selections and Inputting Data with the CLI

The CLI is character-based. It recognizes the fewest unique characters it needs to correctly identify an entry. For example, in the *Access Gateway Menu* you need only enter **c** to access the *Configuration* menu, but you must enter **su** to access the *Subscribers* menu and **sy** to access the *System* menu (because they both start with the letter "s").

You may also do any of the following:

- Enter **b** (back) or press **Esc** (escape) to return to a previous menu.
- Press **Esc** to abort an action at any time.
- Press **Enter** to redisplay the current menu.
- Press **?** at any time to access the CLI's *Help* screen.

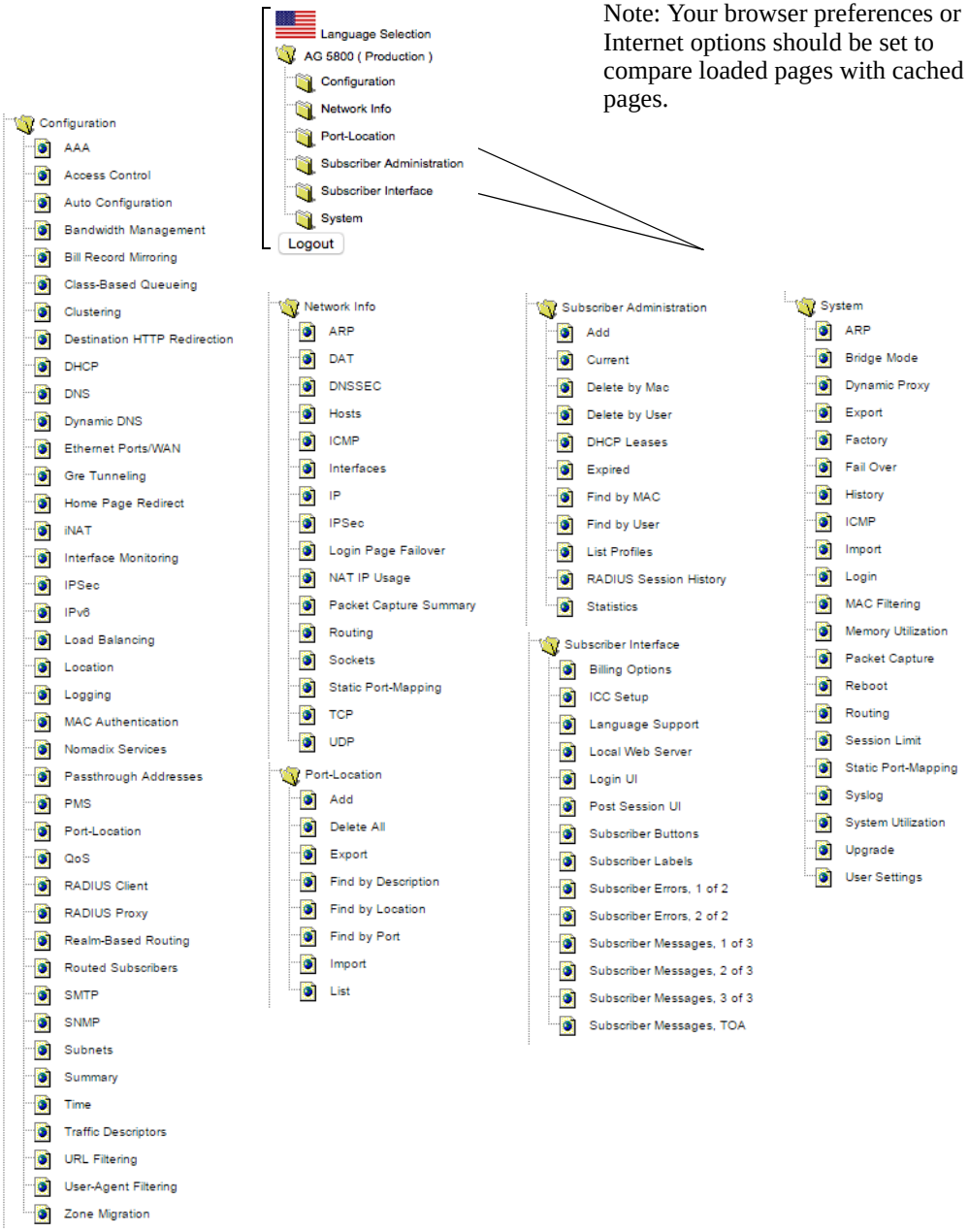
When using the CLI, if a procedure asks you to "enter sn," this means you must type **sn** and press the **Enter** key. The system does not accept data or commands until you hit the *Enter* key.

Menu Organization (Web Management Interface)

When you have successfully installed and configured the Access Gateway from the CLI, you can then access the Access Gateway from its embedded Web Management Interface (WMI). The WMI is easier to use (point and click) and includes some items not found in the CLI. You can use either interface, depending on your preference.

For a complete description of all features available in the WMI, see "Using the Web Management Interface (WMI)" on page 78.

The following "composite" screen shows how the Access Gateway's WMI menus (folders) are organized (shown here side-by-side for clarity and space). See also, "About Your Product License" on page 80.



Note: Your browser preferences or Internet options should be set to compare loaded pages with cached pages.

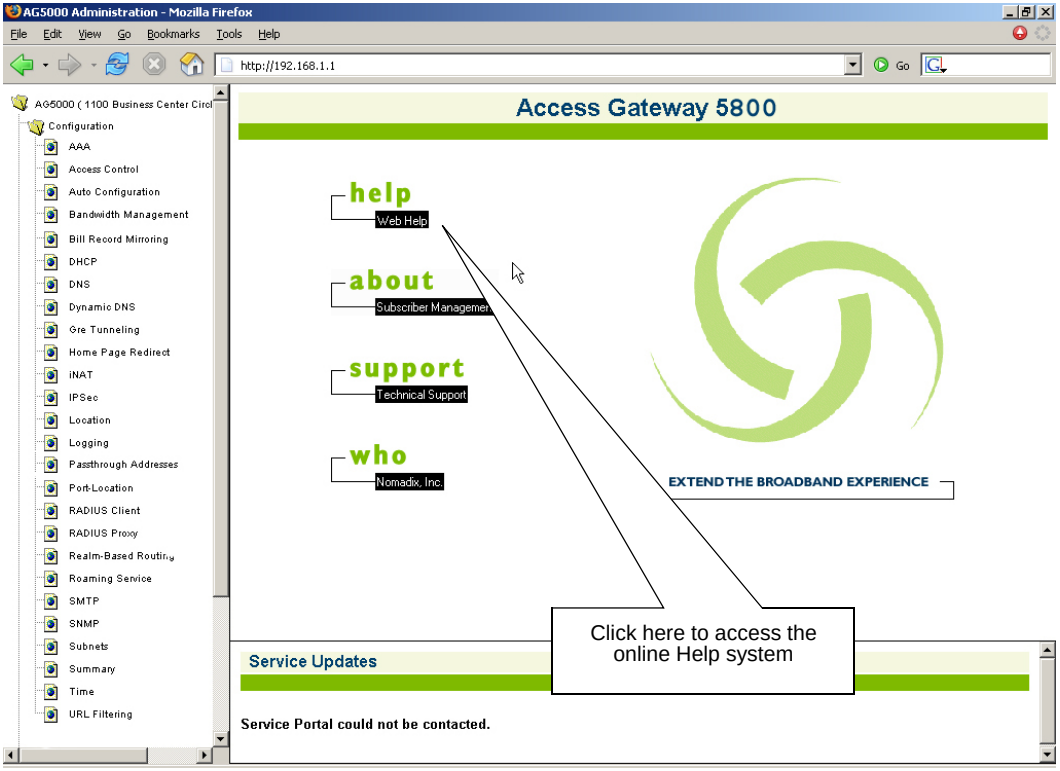
Inputting Data – Maximum Character Lengths

The following table details the maximum allowable character lengths when inputting data:

Data Field	Max. Characters
All Messages (billing options)	72
All Messages (subscriber error messages)	72
All Messages (subscriber login UI)	72
All Messages (subscriber “other” messages)	72
Description of Service (billing options Plan)	140
Home Page URL	237
Host Name and Domain Name (DNS settings)	64
IP / DNS Name (passthrough addresses)	237
Label (billing options plan)	16
Location settings (all fields)	99
Partner Image File Name	12
Password (adding subscriber profiles)	128
Port Description (finding ports by description)	63
Redirection Frequency (in minutes)	2,147,483,647 (recommend 3600)
Reservation Number	24
Username (adding subscriber profiles)	96
Valid SSL Certificate DNS Name	64

Online Documentation and Help

The Web Management Interface (WMI) incorporates an online help system which is accessible from the main window.



Other online documentation resources, available from our corporate Web site (*www.nomadix.com/support*), include a full PDF version of this User Guide (viewable with Acrobat™ Reader), README files, white papers, technical notes, and business cases.

Quick Reference Guide

This section provides information to help you navigate and use the management interfaces (CLI and Web) quickly and efficiently. It also contains the product specifications, a listing of the factory default settings, sample log reports, listings of commands (by menu and alphabetical), HyperTerminal settings, and some common keyboard shortcuts.

Establishing the Start Up Configuration

The CLI allows you to administer the Access Gateway's start-up configuration settings.

When establishing the start-up configuration for a new installation, you are connected to the Access Gateway via a direct serial connection (you do not have remote access capability because the Access Gateway is not yet configured or connected to a network). Once the installation is complete (see "Installation Workflow" on page 43*) and the system is successfully configured, you will have the additional options of managing the Access Gateway remotely from the system's Web Management Interface, an SNMP client manager of your choice, or a simple Telnet interface.*

The start up configuration must be established before connecting the Access Gateway to a customer's network. The "start up" configuration settings include:

- Assigning Login User Names and Passwords – You must assign a unique login user name and password that enables you to administer and manage the Access Gateway securely.

  User names and passwords are case-sensitive.

- Setting the SNMP Parameters (optional) – The SNMP (Simple Network Management Protocol) parameters must be established before you can use an SNMP client (for example, HP OpenView) to manage and monitor the Access Gateway remotely.
- Enabling the Logging Options (recommended) – Servers must be assigned and set up if you want to create system and AAA (billing) log files, and retrieve error messages generated by the Access Gateway.

- Assigning the Location Information and IP Addresses:
  - **Assigning the Network Interface IP Address -** This is the public IP address that allows administrators and subscribers to see the Access Gateway on the network. Use this address when you need to make a network connection with the Access Gateway.
  - **Assigning the Subnet Mask** – The subnet mask defines the number of IP addresses that are available on the routed subnet where the Access Gateway is located.
  - **Assigning the Default Gateway IP Address** – This is the IP address of the router that the Access Gateway uses to transmit data to the Internet.

Assigning Login User Names and Passwords

When you initially powered up the Access Gateway and logged in to the Management Interface, the default login user name and password you used was "admin." The Access Gateway allows you to define 2 concurrent access levels to differentiate between managers and operators, where managers are permitted *read/write* access and operators are restricted to *read* access only. Once the logins have been assigned, managers have the ability to perform all write commands (*Submit*, *Reset*, *Reboot*, *Add*, *Delete*, etc.), but operators cannot change any system settings. When Administration Concurrency is enabled, one manager and three operators can access the Access Gateway at any one time (the default setting for this feature is "disabled").

1. Enter **sy** (system) at the *Access Gateway Menu*. The *System* menu appears.
2. Enter **lo** (login).

   The system prompts you for the current login. If this is the first time you are changing the login parameters since initializing the Access Gateway, the default login name and password is "admin."

   The system accepts up to 11 characters (any character type) for user names and passwords. All user names and passwords are case-sensitive.

3. When prompted, confirm the current login parameters and enter new ones.

   Sample Screen Response:

   ```
   System>lo
   Enable/Disable Administration Concurrency [disabled]: e

   Current login: admin
   Current password: *****

   Enter new manager login: newmgr
   Enter new password: ********
   Retype new password: ********
   ```

The administrative login and password were changed

Enter new operator login: newop
Enter new operator password: *****
Retype new operator password: *****

The operator login and password were changed

Enter RADIUS remote test login: rad
Enter new RADIUS remote test password: *****
Retype new RADIUS remote test password: *****

The RADIUS remote test login and password were changed

You must use the new login user name(s) and password(s) to access the system.

Setting the SNMP Parameters (optional)

You can address the Access Gateway using an SNMP client manager (for example, HP OpenView). SNMP is the standard protocol that regulates network management over the Internet. To do this, you must set up the SNMP communities and identifiers. For more information about SNMP, see "Using an SNMP Manager" on page 79.

If you want to use SNMP, you must manually turn on SNMP.

1. Enter **c** (configuration) at the *Access Gateway Menu*. The *Configuration* menu appears.
2. Enter **sn** (snmp).
3. Enable the SNMP daemon, as required. The system displays any existing SNMP contact information and prompts you to enter new information. If this is the first time you have initialized the SNMP command since removing the Access Gateway from its box, the system has no information to display (there are no defaults).
4. Enter the SNMP parameters (communities and identifiers). The SNMP parameters include your contact information, the get/set communities, and the IP address of the trap recipient. Your SNMP manager needs this information to enable network management over the Internet.
5. If you enabled the SNMP daemon, you must reboot the system for your changes to take effect. In this case, enter **y** (yes) to reboot your Access Gateway.

Sample Screen Response:

Configuration>sn

Enable the SNMP Daemon? [Yes]:
Enter new system contact: newname@domainname.com
[Nomadix, Newbury Park, CA]

```
Enter new system location: Office, Newbury Park, CA
Enter read/get community [public]:
Enter write/set community [private]:
Enter IP of trap recipient [0.0.0.0]: 10.11.12.13

SNMP Daemon: Enabled
System contact: newname@domainname.com
System location: Office, Newbury Park, CA
Get (read) community: public
Set (write) community: private
Trap recipient: 10.11.12.13


Reboot to enable new changes? [yes/no] y
Rebooting...
```

You can now address the Access Gateway using an SNMP client manager.

Configuring the WAN interface

If a license key is not present, you will still be directed to set up the WAN configuration as soon as you log into the CLI. However, the subsequent steps are new and network settings are no longer configured under Location.

The following are the steps are needed to configure the main WAN interface:

1. Enter **c** (configuration) at the *Access Gateway Menu*. The *Configuration* menu appears.
2. Enter **eth** (ethernet).
1. After you have entered “yes” to the initial prompt, enter “mod int WAN” or “m i WAN” (“modify interface WAN”). Note that modes and interface names are case sensitive. The configuration then steps through the settings one by one.
2. Port role for the WAN port should be already set to WAN, just hit <enter>
3. Set the configuration mode to match your network settings.
4. Set the remaining network settings .
5. Default uplink and download speed is 15 Mbps. Enter different values if desired.

   Bandwidth and DNS settings are configured separately for each WAN interface. You can configure them later in the WAN configuration dialog in the Web Management Interface.
6. If you do not wish to configure additional NAT IP addresses at this time, type “b”.
7. A summary of the WAN port settings is now displayed; if they are correct, type “b” again.

You will now see the Nomadix location configuration page. Enter contact data and agree to the Nomadix End User License Agreement. Your license will be retrieved when you enter “y”. The NSE will then reboot to activate your license settings.

```
Configuration>eth

    show all                - Show all WAN Interface configuration
    show interface <name>   - Show a single WAN Interface configuration
    modify interface <name> - Modify a single WAN Interface configuration

Type b to go back, <esc> to abort, ? for help.

Ethernet port/WAN interface configuration>mod int WAN

Port Role                       [wanIf          ] (outOfService, subscriberIf, wanIf) :
Configuration Mode              [static         ] (static, dhcp, pppoe) :
IP Address                      [67.130.149.57  ] :
Subnet Mask                     [255.255.255.128] :
Gateway IP                      [67.130.149.126 ] :
GW ARP Refresh Interval (secs)  [120            ] :
Bandwidth uplink speed          [15000          ] :
Bandwidth downlink speed        [15000          ] :
WAN 802.1Q tagging              [Disabled       ] :
VLAN ID                         [1              ] :
DNS Domain Name                 [nomadix2.com   ] :
DNS Server 1                    [67.130.149.123 ] :
DNS Server 2                    [8.8.8.8        ] :
DNS Server 3                    [0.0.0.0        ] :
Additional NAT IP addresses     [Disabled       ] :

Additional NAT IP address configuration for WAN:
    show all                  - Show additional NAT IP addresses
    add ipaddress             - Add a new NAT IP address
    delete ipaddress <ipaddr> - Delete an existing NAT IP address

Type b to go back, <esc> to abort, ? for help.


Additional NAT IP address configuration for WAN>
```

Enabling the Logging Options (recommended)

System logging creates log files and error messages generated at the system level. AAA logging creates activity log files for the AAA (Authentication, Authorization, and Accounting) functions. You can enable either of these options.

Although the AAA and billing logs can go to the same server, we recommend that they have their own unique server ID number assigned (between 0 and 7). When managing multiple properties, the properties are identified in the log files by their IP addresses.

When system logging is enabled, the standard SYSLOG protocol (UDP) is used to send all message logs generated by the Access Gateway to the specified server.

1. Enter **log** (logging) at the *Configuration* menu. The system displays the current logging status (enabled or disabled).
2. Enable or disable the system and/or AAA logging options, as required. If you enable either option, go to Step 3, otherwise logging is disabled and you can terminate this procedure.
3. Assign a valid ID number (0-7) to each server.
4. Enter the IP addresses to identify the location of the system and AAA SYSLOG servers on the network (the default for both is 0.0.0.0).

When logging is enabled, log files and error messages are sent to these servers for future retrieval. To see sample reports, go to "Sample SYSLOG Report" on page 314 and "Sample AAA Log" on page 313.

Sample Screen Response:

```
Configuration>log

Enable/disable System Log       [disabled      ]: enable
Enter System Log Number (0-7)   [0             ]: 2
Enter System Log Filter

0: Emergency
1: Alert
2: Critical
3: Error
4: Warning
5: Notice
6: Info
7: Debug

Select an option from above     [7]: 7
Enter System Log Server IP      [255.255.255.255]: 10.10.10.10
Enable/disable System Log Save to file [disabled       ]: enable

Enable/disable AAA Log      [disabled      ]: enable
Enter AAA Log Number (0-7)  [0             ]: 2
Enter AAA Log Filter

0: Emergency
1: Alert
2: Critical
3: Error
4: Warning
5: Notice
6: Info
7: Debug

Select an option from above     [7]: 7
Enter AAA Log Server IP     [255.255.255.255]: 10.10.10.10
Enable/disable AAA Log Save to file [disabled       ]: enable

Enable/disable RADIUS History Log      [disabled      ]: enable
Enter RADIUS History Log Number (0-7)  [0             ]: 2
Enter RADIUS History Log Filter

0: Emergency
1: Alert
```

```
2: Critical
3: Error
4: Warning
5: Notice
6: Info
7: Debug

Select an option from above     [6]: 7
Enter RADIUS History Log Server IP      [255.255.255.255]: 10.10.10.10
Enable/disable RADIUS History Log Save to file [disabled       ]: enable

Enable/disable System Report Log       [disabled       ]: enable
Enter System Report Log Number (0-7)   [0              ]: 2
Enter System Report Log Server IP      [255.255.255.255]: 10.10.10.10
Enter System Report Log interval (minutes)          [0]: 5

Enable/disable Tracking Log       [disabled       ]: enable
Enter Tracking Log Number (0-7)   [0              ]: 2
Enter Tracking Log Server IP      [255.255.255.255]: 10.10.10.10
Enable/disable Tracking Log Save to file [disabled       ]:
Enable/Disable Name Reporting     [disabled       ]: enable
Enable/Disable Port Reporting     [disabled       ]: enable
Enable/Disable Location Reporting [disabled       ]: enable
Enable/Disable 500th Packet Count Reporting [disabled       ]: enable

        System Log                  Enabled
        System Log Number             2
        System Log Filter           7
        System Log Server IP          10.10.10.10
        System Log Save to file       Enabled

          AAA Log                   Enabled
          AAA Log Number              2
          AAA Log Filter            7
          AAA Log Server IP           10.10.10.10
          AAA Log Save to file        Enabled

RADIUS History Log                    Enabled
RADIUS History Log Number               2
RADIUS History Log Filter             7
RADIUS History Log Server IP            10.10.10.10
RADIUS History Log Save to file         Enabled

 System Report Log                    Enabled
 System Report Log Number               2
 System Report Log Server IP            10.10.10.10
 System Report Log Interval (in minutes)  5
```

```
Tracking Log                    Enabled
Tracking Log Number               2
Tracking Log Server IP          10.10.10.10
Tracking Log Save to file       Disabled
Tracking Name Reporting           Enabled
Tracking Port Reporting         Enabled
Tracking Location Reporting       Enabled
Tracking Report every 500th packet  Enabled

WARNING: Communication between the gateway and the syslog server may need to be
secured to comply with local laws. Consider routing communication through an IPSec tunnel.

Configuration>
```

Logging Out and Powering Down the System

Use this procedure to log out and power down the Access Gateway.

1. Enter l (logout) at the Access Gateway Menu. Your serial session closes automatically.
2. Turn off the Access Gateway and disconnect the power cord.
3. Disconnect the cable between the Access Gateway and your computer.

Connecting the Access Gateway to the Customer's Network

Use this procedure to connect the Access Gateway to the customer's network (after the start up configuration parameters have been established).

1. Choose an appropriate physical location that allows a minimum clearance of 4cm either side of the unit (for adequate airflow).
2. Connect the Access Gateway to the router, then connect the Access Gateway to the customer's subscriber port.
3. Connect the power cord and turn on the Access Gateway.
4. Go to "Establishing the Basic Configuration for Subscribers" on page 67.

Establishing the Basic Configuration for Subscribers

When you have successfully established the start up configuration and installed the unit onto the customer's network, connect to the Access Gateway via Telnet. You must now set up the basic configuration parameters for subscribers, including:

- Setting the DHCP Options – DHCP (Dynamic Host Configuration Protocol) allows you to assign IP addresses automatically (to subscribers who are DHCP enabled). The Access Gateway can "relay" the service through an external DHCP server or it can be configured to act as its own DHCP server.
- Setting the DNS Options – DNS (Domain Name System) allows subscribers to enter meaningful URLs into their browsers (instead of complicated numeric IP addresses). DNS converts the URLs into the correct IP addresses automatically.

Setting the DHCP Options

When a device connects to the network, the DHCP server assigns it a "dynamic" IP address for the duration of the session. Most users have DHCP capability on their computer. To enable this service on the Access Gateway, you can either enable the DHCP relay (routed to an external DHCP server IP address), or you can enable the Access Gateway to act as its own DHCP server. In both cases, DHCP functionality is necessary if you want to automatically assign IP addresses to subscribers.

The Access Gateway's adaptive configuration technology provides Dynamic Address Translation (DAT) functionality. DAT is automatically configured to facilitate "plug-and-play" access to subscribers who are misconfigured with static (permanent) IP addresses, or subscribers that do not have DHCP capability on their computers. DAT allows all users to obtain network access, regardless of their computer's network settings.

1. Enter **c** (configuration) at the *Access Gateway Menu*. The *Configuration* menu appears.
2. Enter **dh** (dhcp).

By default, the Access Gateway is configured to act as its own DHCP server and the relay feature is "disabled.". Please verify that your DHCP Server supports DHCP packets before enabling the relay. Not all devices containing DHCP servers (for example, routers) support DHCP Relay functionality.

When assigning a DHCP Relay Agent IP address for the DHCP Relay, ensure that the IP address you use does not conflict with devices on the network side of the Access Gateway.

Although you cannot enable the DHCP relay and the DHCP service at the same time, it is possible to "disable" both functions from the Command Line Interface. In this case, a warning message informs you that no DHCP services are available to subscribers.

3. Follow the on-screen instructions to set up your DHCP options. For example:

Sample Screen Response:

```
Configuration>dh

Enable/Disable IP Upsell          [disabled      ]:
Enable/Disable DHCP Relay         [disabled      ]:
Enable/Disable DHCP Server        [enabled       ]:
Enable/Disable Subnet-based DHCP Service       [disabled
Enable/Disable Forwarded DHCP Clients [disabled      ]:

IP Upsell                    Disabled
DHCP Relay                   Disabled
External DHCP Server IP      0.0.0.0
DHCP Relay Agent IP          0.0.0.0
DHCP Server                  Enabled
DHCP Server Subnet-based     Disabled
Forwarded DHCP Clients       Disabled

Server-IP      Server-Netmask  Start-IP      End-IP          Lease   Type    IPUp

208.11.0.4     255.255.0.0     208.11.0.5    208.11.0.7      20      PRIV    NO
10.0.0.4       255.255.255.0   10.0.0.5      10.0.0.250      30      PRIV    NO *
* Default IP Pool
DHCP IP Pools Configuration:
0 - Show IP Pools
1 - Add a new IP Pool
2 - Modify an IP Pool
3 - Remove an IP Pool
4 - Exit this menu
Select the DHCP Pool configuration mode [0]:
```

DHCP Options from RFC 2132

You can configure DHCP options as defined in RFC 2132. The configured options are sent to subscribers who obtain their network configuration from the NSE via DHCP.

This capability only applies to the NSE's DHCP *Server function*. There is no change to the NSE's operation as a DHCP client.

The options are configurable on a per-pool basis. Different sets of options can be configured for different pools.

A given DHCP option consists of an option code and a value. RFC 2132 details the various available options, and the data type for each. The NSE will validate the data entered to ensure that it is type-correct for the option code in question. If it is incorrect, the option is not accepted.

Numerical integer values can be entered in decimal format, or hex format using a "0x" prefix.

The following DHCP option codes are supported:

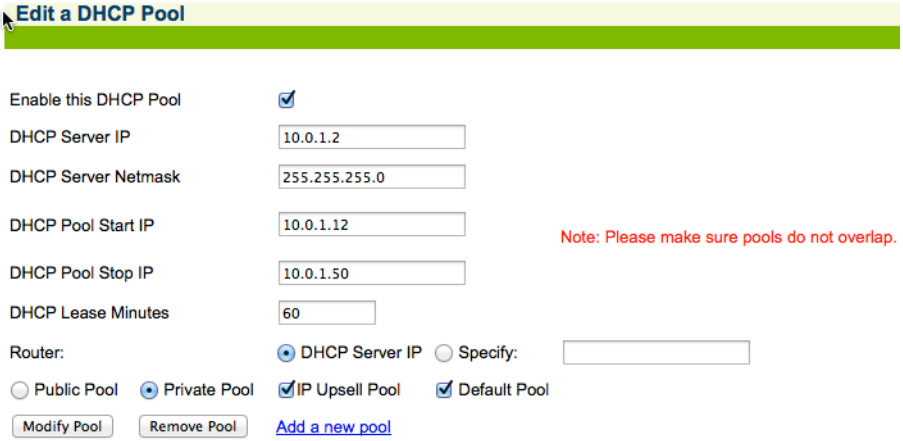
Option Description	Option Code
Single IP address	16, 28, 32
List of one or more IP addresses	3-5, 7-11, 41-42, 44-45, 48-49, 65, 69-76
List of zero or more IP addresses	68
List of one or more pairs of IP addresses (or address/mask pairs)	21, 33
32-bit unsigned integer value	2, 24, 35, 38
16-bit unsigned integer value	13, 22, 26
8-bit unsigned integer value	23, 37, 46
List of 1 or more 16-bit unsigned integer values	25
Single octet Boolean (value may be 1 or 0)	19-20, 27, 29-31, 34, 36, 39
Sequence of 1 or more octets	43
Ascii string of 1 or more printable characters	12, 14, 17-18, 40, 47, 64, 66-67

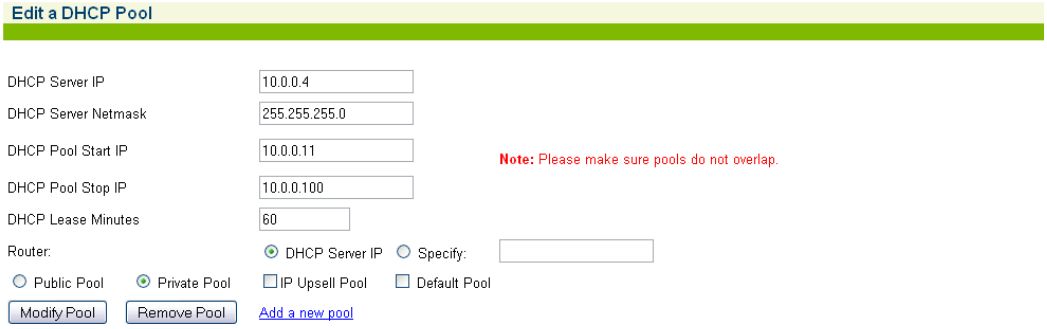
Disallowed options: Some option codes are not allowed, for one of the following reasons:

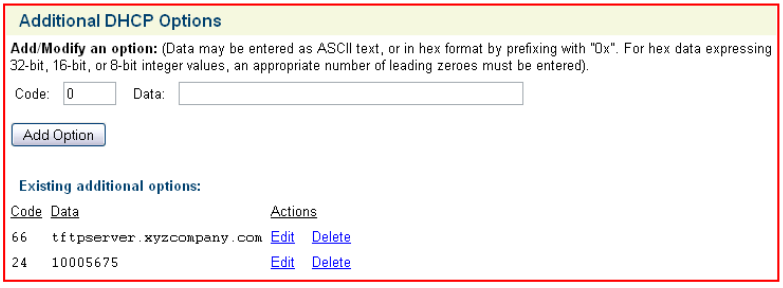
- Items that are already configured elsewhere as a separate DHCP pool or NSE configuration parameter, and/or are derived from one that is. Includes options 1 (subnet mask), 3 (router), 6 (domain name server), 15 (domain name), 51 (lease time), 54 (server identifier), 58 (renewal time), 59 (rebinding time).
- Items not valid in a DHCP offer or ACK message. Includes options 50 (requested IP address), 55 (parameter request list), 56 (error message), 57 (maximum message size), 60 (vendor class identifier), 61 (client identifier).
- Items generated automatically by the mechanism of DHCP message construction, which carry no application information. Includes options 0 (pad), 52 (option overload), 53 (DHCP message type), 255 (end).

Unrecognized options: Options 62-63, 77-254 are unrecognized. Some of these codes are legitimate and are defined in other RFCs, while others are not defined. These option codes are not explicitly disallowed on the NSE, but the NSE is “unaware” of them – that is, it will make no attempt to validate either the code or the data. It is the administrator’s responsibility to ensure that the option codes and data entered are legitimate.

The following screens illustrate adding additional DHCP options to a DHCP Pool.

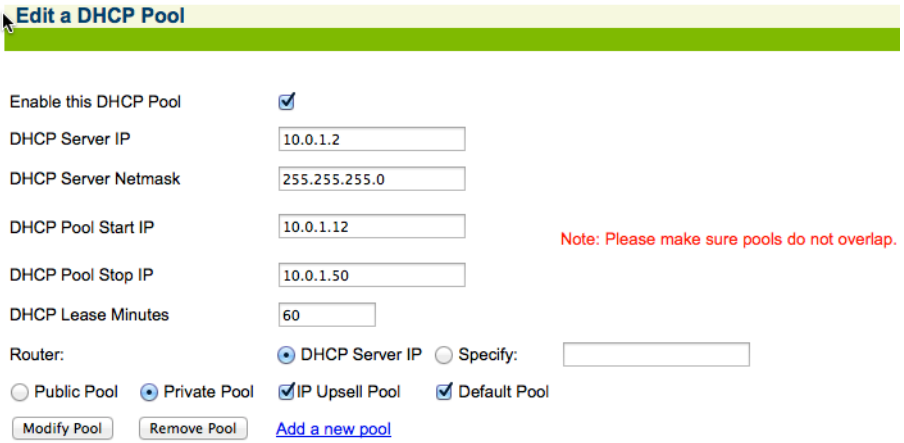




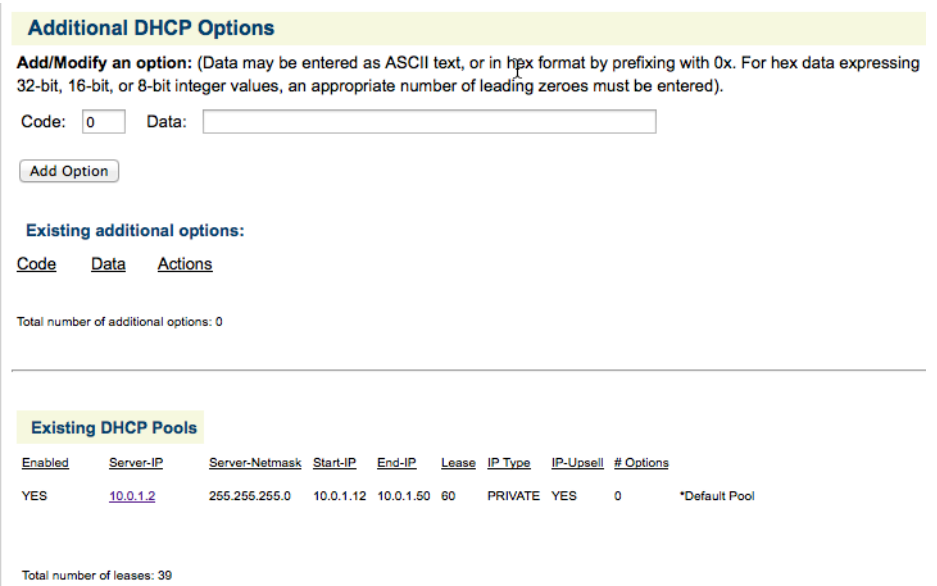


DHCP Dynamic Enable and Disable

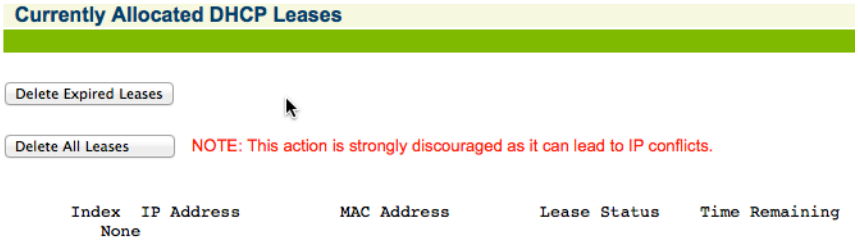
Click **Configuration->DHCP**. Click the **Server-IP** and **Enable this DHCP Pool**. Note that DHCP enable/disable is dynamic, no reboot required.



Click **Configuration->DHCP**. A new column under existing DHCP Pools table for DHCP pool enable is introduced. See box in Red below.


Additional DHCP Options
Add/Modify an option: (Data may be entered as ASCII text, or in hex format by prefixing with 0x. For hex data expressing 32-bit, 16-bit, or 8-bit integer values, an appropriate number of leading zeroes must be entered).
Code: 0
Data:
Add Option
Existing additional options:
Code Data Actions
Total number of additional options: 0
Existing DHCP Pools
Enabled Server-IP Server-Netmask Start-IP End-IP Lease IP Type IP-Upsell # Options
YES 10.0.1.2 255.255.255.0 10.0.1.12 10.0.1.50 60 PRIVATE YES 0 *Default Pool
Total number of leases: 39

Click **Subscriber Administration->DHCP Leases**. The DHCP leases Page displays all the current DHCP leases on the NSE.


Currently Allocated DHCP Leases
Delete Expired Leases
Delete All Leases
NOTE: This action is strongly discouraged as it can lead to IP conflicts.
Index IP Address MAC Address Lease Status Time Remaining
None

Setting the DNS Options

DNS allows subscribers to enter meaningful URLs into their browsers (instead of complicated numeric IP addresses) by automatically converting the URLs into the correct IP addresses. You

can assign a primary, secondary, or tertiary (third) DNS server. The Access Gateway utilizes whichever server is currently available.

You must configure DNS if you want to enter meaningful URLs instead of numeric IP addresses into any of the Access Gateway's configuration screens.

Use the following procedure to set the DNS configuration options.

1. Enter **c** (configuration) at the *Access Gateway Menu*. The *Configuration* menu appears.
2. Enter **dn** (dns) at the *Configuration* menu. The system displays the current domain (the default is "nomadix").
3. Enter a valid domain name (the Internet domain that DNS requests will utilize).
4. Enter the host name (the DNS name of the Access Gateway). The host name must not contain any spaces.

   After assigning the host name, the system requests IP addresses for the primary, secondary, and tertiary DNS servers (the default for the DNS primary address is 0.0.0.2).

The secondary and tertiary DNS servers are only utilized if the primary DNS server is unavailable.

5. Enter the IP addresses for the DNS servers (located at the customer's network operating center where DNS requests are sent).
6. You must now reboot the system for your settings to take effect. Enter **y** (yes) to reboot the Access Gateway

Sample Screen Response:

```
Configuration>dns

NOTE: If DHCP Client or PPPoE Client is enabled, the Primary and
Secondary DNS Server may not be configured, since the DHCP/PPPoE server
may provide those items. Furthermore, if DHCP Client is configured, the
Domain may not be configured.

Enter domain                    [nomadix.com    ]:
Enter host name (no spaces)     [usg            ]:
Enter primary DNS               [0.0.0.2        ]: 4.2.2.2
Enter secondary DNS             [0.0.0.0        ]:
Enter tertiary DNS              [0.0.0.0        ]:
Enter DNS Redirection Port      [1029           ]:
Enter Proxy DNS Port            [1028           ]:
The system must be rebooted to function properly.
```

The DNS options have been established. DNS will now convert subscriber browser URLs into the correct IP addresses automatically.

Archiving Your Configuration Settings

Once you have installed your Access Gateway and established the configuration settings, you should write the settings to an archive file. If you ever experience problems with the system, your archived settings can be restored at any time.

Refer to the following procedures:

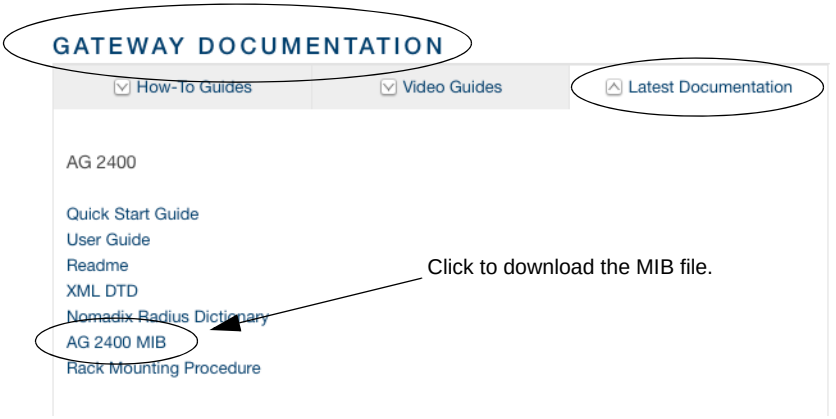
- "Exporting Configuration Settings to the Archive File {Export}" on page 252.
- "Importing Configuration Settings from the Archive File {Import}" on page 257.

Installing the Nomadix Private MIB

The Nomadix Private Management Information Base (MIB) allows you to view and manage SNMP objects on your Access Gateway. To use the MIB, you must obtain the appropriate *nomadix.mib* file for your Access Gateway. This file is available in the Support area of the Nomadix web site.

Obtaining the Management Information Base (MIB) file

1. Visit www.nomadix.com/support.
2. Scroll to "Gateway Documentation".
3. Click "Latest Documentation"
4. Scroll to the group for your Access Gateway model.
5. Click the link to download the MIB file for your Access Gateway.



Configuring the Management Information Base

1. Import the *nomadix.mib* file into your SNMP client manager.
2. Connect to the Access Gateway from a node on the network that is accessible via the Access Gateway's network port (Internet, LAN, etc.). Be sure to enable the SNMP daemon on the Access Gateway (available on the Access Gateway's CLI or Web Management Interface, under the *Configuration* menu – **snmp**).
3. All variables defined by Nomadix start with the following prefix:

   iso.org.dod.internet.private.enterprises.nomadix
4. You should now be able to define queries and set the SNMP values on your Access Gateway. If necessary, consult this User Guide or your SNMP client manager's documentation for further details.

We recommend that you change the predefined community strings in order to maintain a secure environment for your Access Gateway.

System Administration

This section provides all the instructions and procedures necessary for system administrators to manage the Access Gateway on the customer's network (after a successful installation).

The system administration procedures in this section are organized as they are listed under their respective Web Management Interface (WMI) menus:

- "Configuration Menu" on page 80
- "Network Info Menu" on page 179
- "Port-Location Menu" on page 191
- "Subscriber Administration Menu" on page 203
- "Subscriber Interface Menu" on page 217
- "System Menu" on page 250

Now that the Access Gateway has been installed and configured successfully, this User Guide moves away from the Command Line Interface (CLI) and documents the Access Gateway from the Web Management Interface (WMI) viewpoint.

Choosing a Remote Connection

Once installed and configured for the customer's network, the Access Gateway can be managed and administered remotely with any of the following interface options:

- Using the Web Management Interface (WMI) - Provides a powerful and flexible Web interface for network administrators.
- Using an SNMP Manager - Allows remote "Windows" management using an SNMP client manager (for example, HP OpenView). However, before you can use SNMP to access the Access Gateway, you must set up the appropriate SNMP communities. For more information, refer to "Managing the SNMP Communities {SNMP}" on page 167.
- Using a Telnet Client

To use any of the remote connections (Web, SNMP, or Telnet), the network interface IP address for the Access Gateway must be established (you did this during the installation process).

Choose an interface connection, based on your preference.

Using the Web Management Interface (WMI)

The Web Management Interface (WMI) is a “graphical” version of the Command Line Interface, comprised of HTML files. The HTML files are embedded in the Access Gateway and are dynamically linked to the system’s functional command sets. You can access the WMI from any Web browser.

Your browser preferences or Internet options should be set to compare loaded pages with cached pages.

To connect to the Web Management Interface, do the following:

1. Establish a connection to the Internet.
2. Open your Web browser.
3. Enter the network interface IP address of the Access Gateway (set up during the installation process).
4. Log in as usual (supplying your user name and password).

To access any menu item from the WMI, click on the item you want. The corresponding work screen then appears in the right side frame. From here you can control the features and settings related to your selection. Although the appearance is very different from the Command Line Interface, the information displayed to you is basically the same. The only difference between the two interfaces is in the method used for making selections and applying your changes (selections are checkable boxes, and applying your changes is achieved by pressing the **Submit** button). Pressing the **Reset** button resets the screen to its previous state (clearing all your changes without applying them).

Selecting the language of the Web Management Interface

You can click on Language Selection to change the language of the Web Management Interface text. Currently English (U.S.) and Chinese (simplified) are provided.

Using an SNMP Manager

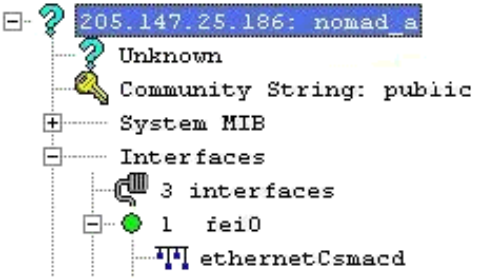
Once the SNMP communities are established, you can connect to the Access Gateway via the Internet using an SNMP client manager (for example, HP OpenView). SNMP is the standard protocol used in the Network Management (NM) system. This system contains two primary elements:

- **Manager –** The console (client) through which system administrators perform network management functions.
- **Agent –** An SNMP-compliant device which stores data about itself in a Management Information Base (MIB). The Access Gateway is an example of such a device.

The Access Gateway contains managed objects that directly relate to its current operational state. These objects include hardware configuration parameters and performance statistics.

Managed objects are arranged into a virtual information database, called a Management Information Base (MIB). SNMP enables *managers* and *agents* to communicate with each other for the purpose of accessing these MIBs and retrieving data. See also, "Installing the Nomadix Private MIB" on page 75.

The following example shows a (partial) SNMP screen response.



Using a Telnet Client

There are many Telnet clients that you can use to connect with the Access Gateway. Using Telnet provides a simple terminal emulation that allows you to see and interact with the Access Gateway's Command Line Interface (as if you were connected via the serial interface). As with any remote connection, the network interface IP address for the Access Gateway must be established (you did this during the installation process).

Logging In

To access the Access Gateway's Web Management Interface, use the *Manager* or *Operator* login user name and password you defined during the installation process (refer to Assigning Login User Names and Passwords).

User names and passwords are case-sensitive.

About Your Product License

Some features included in this section will not be available to you unless you have purchased the appropriate product license from Nomadix. In this case, the following statement will appear either immediately below the section heading or when the feature is mentioned in the body text:

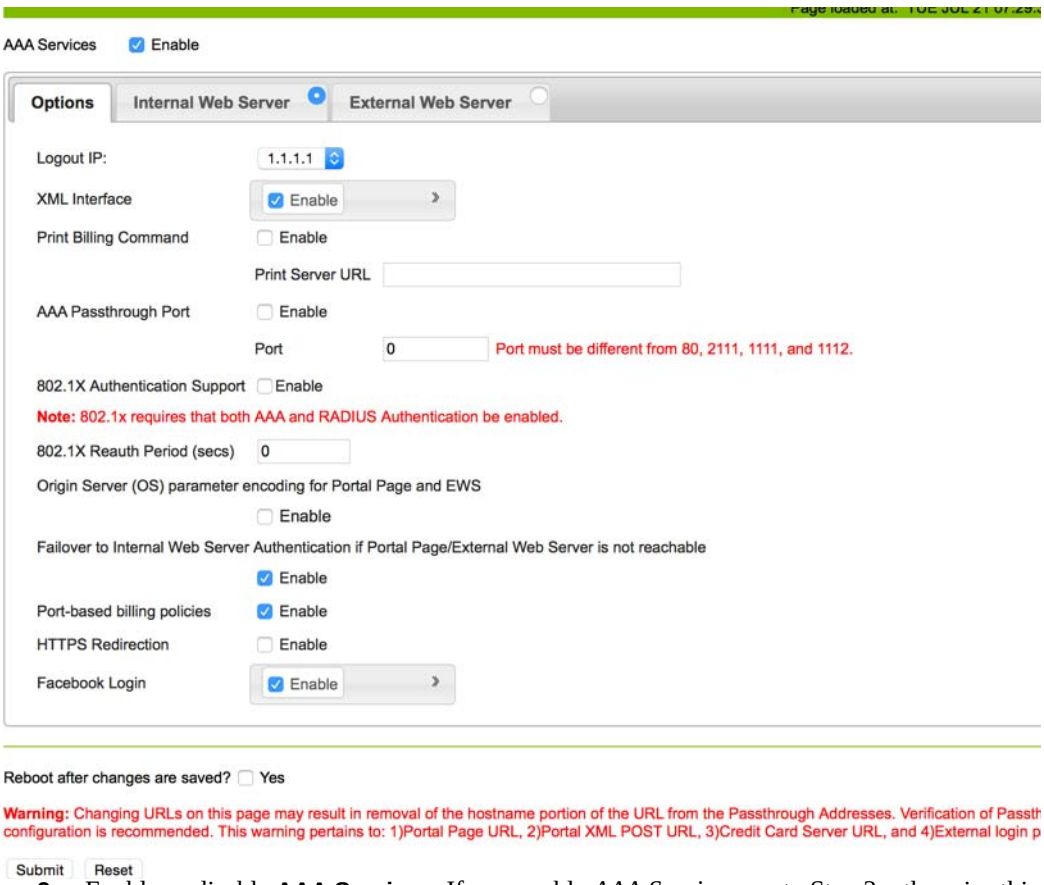
Your product license may not support this feature. You can upgrade your product license at any time.

Configuration Menu

Defining the AAA Services {AAA}

This procedure shows you how to set up the AAA (Authentication, Authorization, and Accounting) service options. *AAA Services* are used by the Access Gateway to authenticate, authorize, and subsequently bill subscribers for their use of the customer's network. The Access Gateway currently supports several AAA models which are discussed in "Subscriber Management" on page 278.

1. From the Web Management Interface, click on **Configuration**, then **AAA**. The *Authentication Authorization and Accounting Settings* screen appears:



2. Enable or disable **AAA Services**. If you enable *AAA Services*, go to Step 3, otherwise this feature is disabled and you can exit the procedure.
3. Select a **Logout IP** address from the drop-down list. The list contains IP address that can be used as the logout IP address. The default IP address is 1.1.1.1.
4. Enable or disable the **XML Interface**, as required.

   XML is used by the Access Gateway's subscriber management module for port location and user administration. Enabling the XML interface allows the Access Gateway to accept and process XML commands from an external source. XML commands are sent over the network to the Access Gateway. The Access Gateway parses the query string, executes the commands specified by the string, and returns data to the system that initiated the command request.
5. If you enabled the *XML Interface* feature, enter the **XML IP** (server) address.

6. Enable or disable **Print Billing Command**, as required. This feature enables NSE to support Driverless Print servers. If this feature is enabled, you must enable the XML interface and enter the IP address for the XML interface (Step 3 and Step 4). With Print Billing enabled, print servers can bill subscribers' rooms for printing their documents without them having to install printers.

   The DNS name print.server.com will internally resolve to the Configured Print Server URL that is entered in the configuration. When subscribers are redirected to the Print Server the NSE adds Parameters to that request, so that the Server is able to charge the proper subscriber.

   With these variables sent to the server it can now send the XML command to bill the users properly.

   Print Server IP needs to be entered as one of the XML server IP for the command to successfully complete.

   The XML command is:

```
<USG COMMAND="BILL_PRINT" IP_ADDR="">
        <ROOM_NUM></ROOM_NUM>
        <DOC_NAME></DOC_NAME>
        <NUM_COPIES></NUM_COPIES>
        <NUM_PAGES></NUM_PAGES>
        <COST></COST>
        <TIME_SUBMITTED></TIME_SUBMITTED>
</USG>
```

   Subscribers could get to print.server.com by:

   - ICC button link
   - Printout in the hotel room
   - Link from the hotel's HPR Page.

   Your product license may not support this feature.

7. Enable or disable the **AAA Passthrough Port** feature, as required. System administrators can set the Access Gateway to pass-through HTTPS traffic, in addition to standard port 80 traffic, without being redirected. When access to a non-HTTPS address (for example, a Search Engine or News site) has been requested, the subscriber is then redirected as usual.

8. If AAA passthrough is enabled, enter the corresponding port number.

   The port number must be different than 80, 2111, 1111, or 1112.

9. Enable or disable the **802.1x Authentication Support** feature, as required.

   Both AAA and RADIUS Authentication must be enabled for 802.1x Authentication support.

10. Enable or disable the **Origin Server (OS) parameter encoding for Portal Page and EWS** feature, as required.

11. You can choose to **Enable failover to Internal Web Server Authentication if Portal Page/External Web Server is not reachable** by placing a check in that box.

12. Enable or disable **Port Based Billing Policies**.

    The Port Location capabilities on the NSE have been enhanced. It is now possible to define a policy on a port. The billing methods (RADIUS, Credit Card, PMS, L2TP Tunneling) and the billing plans available on each port can now be individually configured.

    This ability allows for having different billing methods and billing plans on different ports identified by VLANs or SNMP Port Query of the concentrator. A practical application of this feature is to have a normal hotel room with a plan A that is $9.99 for a day with PMS billing and have a meeting room with a plan of $14.99 an hour with Credit Card billing.

    In order for the port-based policies to work, you must enable Port Based Billing Policies. See also "Adding and Updating Port-Location Assignments {Add}" on page 192.

13. Enable or disable **HTTPS Redirection**.

    The NSE responds to regular HTTP requests from pending subscribers with a redirection to the login screen. The NSE does not respond to HTTPS requests from pending subscribers (HTTP requests with a destination port = 443) with a redirect; this will result in a timeout or invalid certificate warning.

    Enabling **HTTPS Redirection** adds a security exception to the user's browser to allow the certificate received from the NSE to be always "valid."

14. Enable or disable **Facebook Login**. If you enable Facebook login, you must provide a Facebook App ID and Facebook App secret code. Instructions for creating these are available from Facebook.

15. Depending on which authorization mode you choose, go to the following sub-sections in this procedure:

    - Enabling AAA Services with the Internal Web Server – The IWS is "flashed" into the system's memory and the subscriber's login page is served directly from the Access Gateway.
    - Enabling AAA Services with an External Web Server – In the EWS mode, the Access Gateway redirects the subscriber's login request to an external server (transparent to

the subscriber). The login page served by the EWS reflects the “look and feel” of the solution provider’s network and presents more login options.

Enabling AAA Services with the Internal Web Server

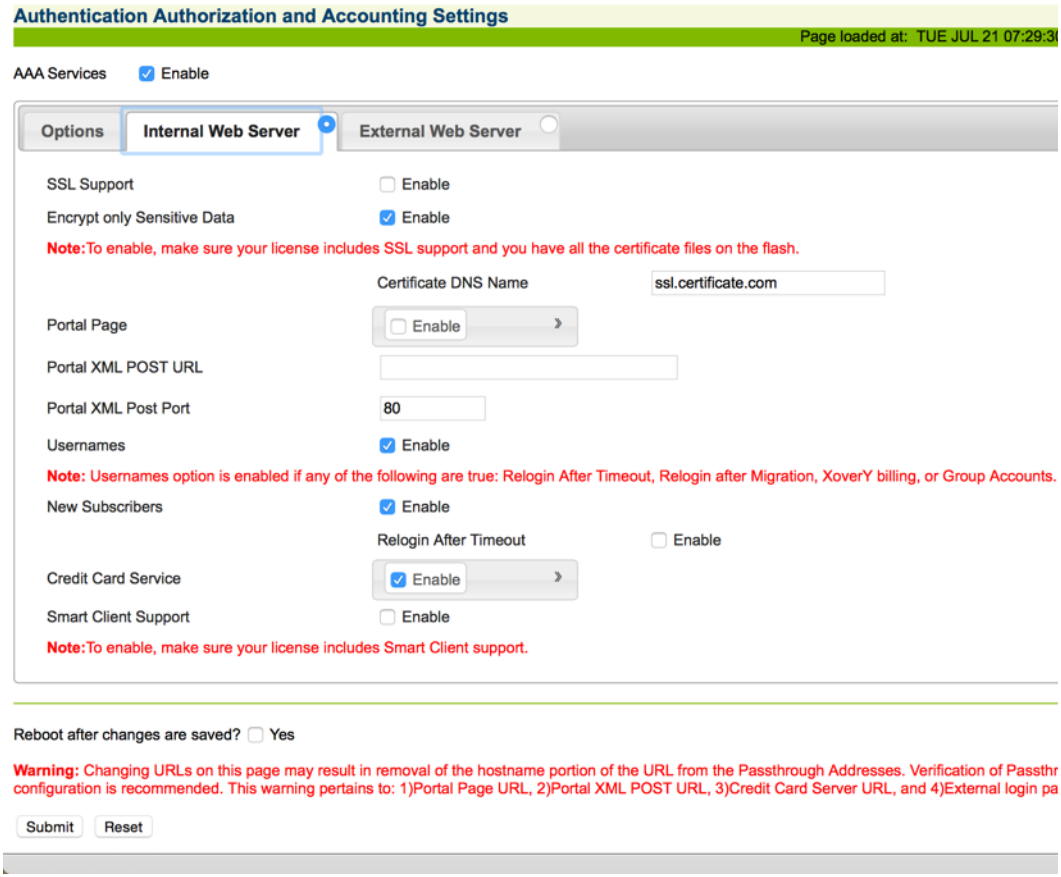
You are here because you want to enable the *AAA Services* with the Access Gateway’s *Internal Web Server*. The Access Gateway maintains an internal database of authorized subscribers, based on their MAC (hardware address) and user name (if enabled). By referring to its database record, also known as an authorization table, the Access Gateway instantly recognizes new subscribers on the network.

You can configure the Access Gateway to handle new subscribers in various ways (see the table on this page). With the IWS, you also have the option of enabling SSL support.

After selecting the *Internal Web Server* authorization mode, you have the option of enabling or disabling the *Usernames* and *New Subscribers* features. These features work in conjunction with each other to determine how new subscribers are handled. Refer to the following table:

Usernames	New Subscribers	System Response
Disabled	Enabled	Allows new subscribers to enter the system without giving a user name and password.
Enabled (*optional*)	Enabled	Allows new subscribers or authentication by their user name and password.
Enabled	Disabled	New subscribers are not allowed. Only existing subscribers are allowed after authenticating their user name and password.
Disabled	Disabled	You will not use this combination unless you want to lock out all subscribers.

1. Select the **Internal Web Server** tab.


Authentication Authorization and Accounting Settings
Page loaded at: TUE JUL 21 07:29:3
AAA Services
Enable
Options
Internal Web Server
External Web Server
SSL Support
Enable
Encrypt only Sensitive Data
Enable
Note:To enable, make sure your license includes SSL support and you have all the certificate files on the flash.
Certificate DNS Name
ssl.certificate.com
Portal Page
Enable
Portal XML POST URL
Portal XML Post Port
80
Usernames
Enable
Note: Usernames option is enabled if any of the following are true: Relogin After Timeout, Relogin after Migration, XoverY billing, or Group Accounts.
New Subscribers
Enable
Relogin After Timeout
Enable
Credit Card Service
Enable
Smart Client Support
Enable
Note:To enable, make sure your license includes Smart Client support.
Reboot after changes are saved?
Yes
Warning: Changing URLs on this page may result in removal of the hostname portion of the URL from the Passthrough Addresses. Verification of Passthr
configuration is recommended. This warning pertains to: 1)Portal Page URL, 2)Portal XML POST URL, 3)Credit Card Server URL, and 4)External login pa
Submit
Reset

2. Enable or disable the **SSL Support** feature, as required. If you enable SSL Support, you must provide a valid **Certificate DNS Name**.

   For more information about setting up SSL, go to "Setting Up the SSL Feature" on page 325.

   SSL support allows for the creation of an end-to-end encrypted link between the Access Gateway and its clients by enabling the Internal Web Server (IWS) to display pages under a secure link—important when transmitting AAA information in a network.

Adding SSL support to the Access Gateway requires service providers to obtain digital certificates from VeriSign™ to create HTTPS pages. Instructions for obtaining certificates are provided by Nomadix.

*To enable SSL Support, your Access Gateway's flash must include the **server.pem**, **cakey.pem**, and **cacert.pem** certificate files (the "cacert.pem" file is provided with your Access Gateway). For assistance, contact* Technical Support.

3. If you want to designate a portal page, you must enable the **Portal Page** feature, otherwise leave this feature disabled.

The Portal Page IP or DNS address are added to the IP passthrough list automatically.

4. If you enabled the Portal Page feature, provide the following supporting information:
   - Portal Page URL
   - Parameter Passing (enabled or disabled)
   - Parameter Signing (including Method, Parameters, and Shared Secret)

See Redirection Parameter Signing *for more information about parameter signing.*

   - Portal XML POST URL
   - Portal XML Post Port
   - Support GIS Clients (enabled or disabled)

GIS stands for Generic Interface Specification, a document written by iPass. Enabling the Smart Client option in the Access Gateway automatically supports all GIS compliant clients using the Internal Web Server. Enabling "Support for GIS Clients" under the Portal Page feature means that the Access Gateway will defer the management of the GIS clients to the Portal Page server.

   - Block IWS Login Page (enabled or disabled)

5. Enable or disable the Usernames feature, as required (refer to the table in "Enabling AAA Services with the Internal Web Server" on page 84).

   Some subscribers may want additional account flexibility and security for their services (for example, if they use more than one computer and their MAC address changes, or if they move between port-locations). In this case, a subscriber can define a unique user name and password which they can use from any machine or location (without being re-charged). Subscribers who choose this option are prompted for their user name and

password whenever they try to access the Internet. Solution providers can charge a fee for this service.

6. Enable or disable the **New Subscribers** feature (refer to the table in "Enabling AAA Services with the Internal Web Server" on page 84).

   New Subscribers must be enabled before enabling the Credit Card and PMS options.

7. If you enabled New Subscribers, enable or disable the **Relogin After Timeout** option.

8. You can now enable or disable the **Credit Card Service**. When this feature is enabled, subscribers are prompted for their credit card information (for billing purposes). The Access Gateway is configured to use *Authorize.net*. You will need to open a merchant account with *Authorize.net* or *Datacenter* (Luxembourg) before this feature can be used.

   Please contact Nomadix Technical Support for assistance. Refer to "Contact Information" on page 349.

   All data communications between the Access Gateway and the credit card server are encrypted by the SSL (Secure Sockets Layer) protocol. The Access Gateway never "sees" subscriber credit card numbers.

9. If you enabled the *Credit Card Service*, define which service you require (**Authorize.net**) from the pull-down menu.

   DNS must be configured if you want to enter meaningful URLs instead of numeric IP addresses into any of the Access Gateway's configuration screens (for example, the Credit Card Server URL in the following step).

10. If the *Credit Card Service* is enabled, enter the information for the following fields:

    - Credit Card Server URL
    - Credit Card Server IP
    - **Merchant ID** (a valid ID issued by the credit card reconciliation service provider – *Authorize.net*).

11. Check the **Use NSE's Hostname and DNS domain name** box if you want the Hostname and domain name to be sent to the Credit Card server instead of the local NSE IP address.

12. Enable or disable the **SIM Compliant** feature, as required. With this feature enabled, you can change the transaction key at your discretion. To change the transaction key, simply

enter the key in the **Change Transaction Key** box, then re-enter the key in the **Verify Transaction Key** box.

The SIM Compliant option refers to Authorize.net's Simple Integration Method.

13. Enable or disable **Smart Client Support**, as required.
14. You can assign a session idle timeout parameter for subscribers (see following note). To assign an idle timeout, simply enter a numeric value (in seconds) in the **Subscriber Idle Timeout** box (the default is 1200).

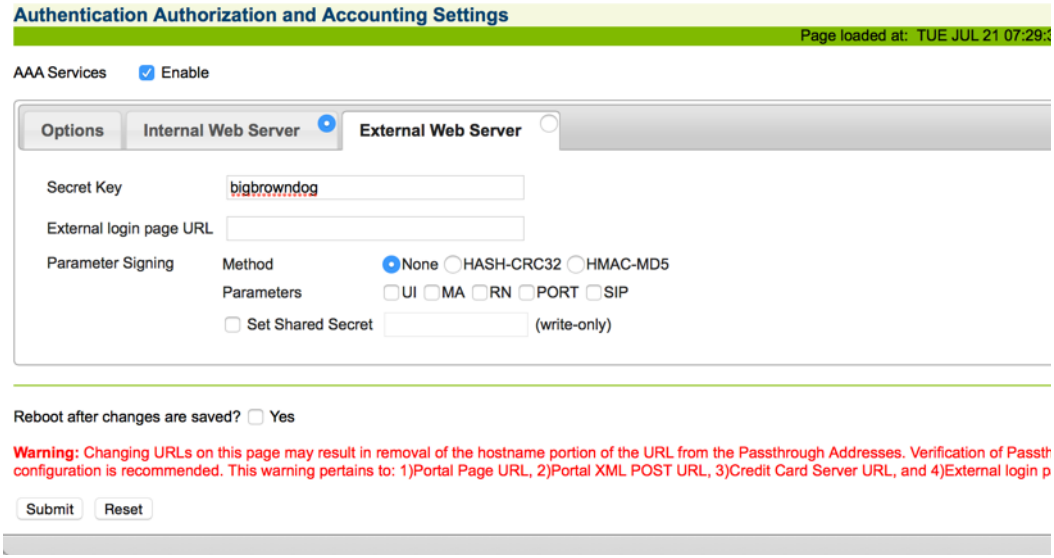
Subscriber Idle Timeout does not apply to RADIUS and Post Pay PMS subscribers.

15. If you enabled or disabled **SSL Support** on this screen, you must reboot the Access Gateway. You can reboot the system by selection **System**>**Reboot** in the Web Management Interface.
16. Click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset all the values to their previous state.

Enabling AAA Services with an External Web Server

You are here because you want to enable the *AAA Services* with an *External Web Server* (EWS). In the EWS mode, the Access Gateway redirects the subscriber's login request to an external server.

1. Select the **External Web Server** tab.



2. Enter the **Secret Key** (The Access Gateway and the external authorization server must use the same secret key). The Secret Key ensures that the response the Access Gateway gets from the External Web Server is valid.

   DNS must be configured if you want to enter meaningful URLs instead of numeric IP addresses into any of the Access Gateway's configuration screens (for example, the External login page URL in the following step).

3. Enter a valid **External login page URL**.

4. Configure the **Parameter Signing** options.

   See Redirection Parameter Signing *for more information about parameter signing.*

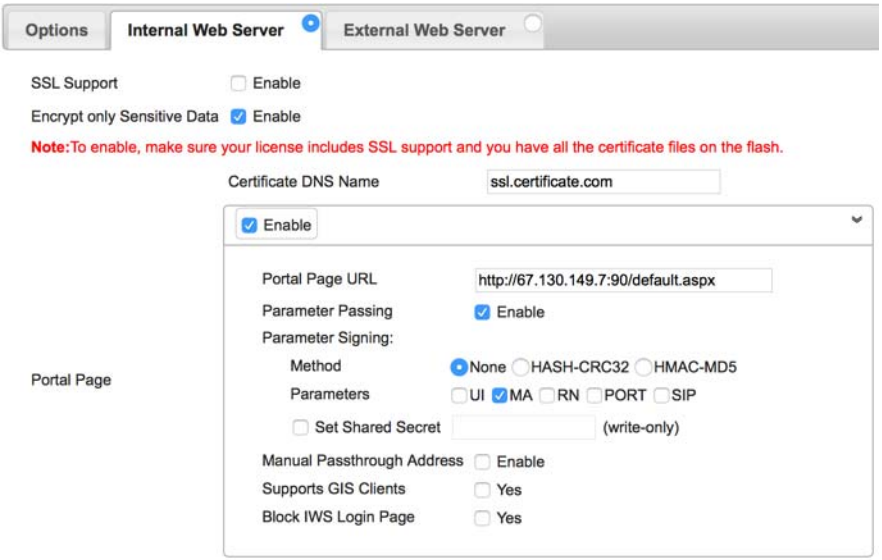
5. Click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset all the values to their previous state (making changes to the EWS settings does not require a system reboot).

Redirection Parameter Signing

External Web Server (EWS) and Internal Web Server (IWS) Portal Page Parameters can be digitally signed, preventing malicious subscribers from intercepting, forging and replaying URL redirection strings used by the NSE and EWS or IWS Portal Page to validate subscriber

access. This capability eliminates a vulnerability that was previously exploited to gain unauthorized Internet access at charge-for-use sites.

The signing feature can create a cryptographically strong signature that protects the sensitive portions of a URL redirection string (i.e., NSE ID, MAC address of the subscriber, etc), while letting the EWS/Portal Page verify that the URL string has not been tampered or forged by the subscriber.



The feature is configured by selecting a signing method, the parameters to be signed, and assigning a secret key.

Two signature methods are supported:

- HASH-CRC32
- HMAC-MD5

Not all parameters that are part of the URL redirection string need to be included in the signature calculation. The following parameters are considered sensitive and can be selected:

- UI (the ID of the NSE)
- MA (the subscriber's MAC address)
- RN (the Room Number)
- PORT (the port number the subscriber is connected to)

The desired secret key simply needs to be entered in the field. Once entered, it is not visible to the user.

Information that indicates which parameters were signed, along with the resultant hash value, are then included in some additional parameters that are appended to the redirection string.

In order to utilize the parameter signing feature, the EWS or Portal Page Server used must be configured to correctly parse and verify the signing information. Documentation that includes guidelines for configuring a server to support signing can be obtained by contacting Nomadix Technical Support.

Establishing Secure Administration {Access Control}

The Access Gateway allows you to block administrator access to interfaces (Telnet, WMI and FTP, SSH and SFTP) and incorporates a master access control list that checks the source (IP address) of administrator logins. A login is permitted only to the interfaces that have not been blocked, and only if a match is made with the master “Source IP” list contained on the Access Gateway. If a match is not made with the “Source IP list,” the login is denied, even if a correct login name and password are supplied. The access control list for source IPs supports up to 50 (fifty) entries in the form of a specific IP address or range of IP addresses.

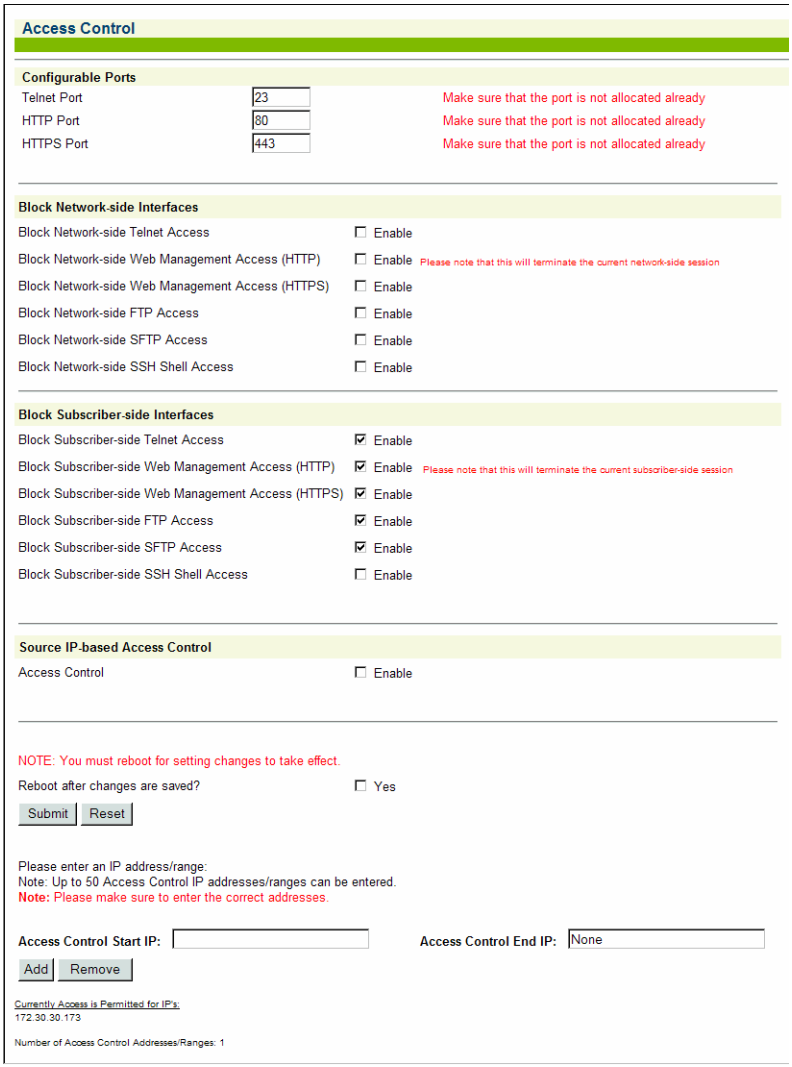
This procedure allows you to enable the “Access Control” feature and block administrator access to specific interfaces, and add or remove administrator “Source IP” addresses.

The NSE supports secure https connections to the Web Management Interface (WMI). Correct certificates must be installed on the NSE flash memory for these connections to function properly. The same certificate set that is used to support SSL connections for subscribers is used for this purpose. For documentation about configuring the system to support secure connections, contact technical support. See Technical Support.

In addition, corresponding options to block https connections (independent of http) are included in the NSE's Access Control functionality, for both the network and subscriber sides.

If the required certificates are not resident on the flash, an attempted https connection will generate an error syslog.

1. From the Web Management Interface, click on **Configuration**, then **Access Control**. The *Access Control* screen appears.


Access Control
Configurable Ports
Telnet Port 23 Make sure that the port is not allocated already
HTTP Port 80 Make sure that the port is not allocated already
HTTPS Port 443 Make sure that the port is not allocated already
Block Network-side Interfaces
Block Network-side Telnet Access Enable
Block Network-side Web Management Access (HTTP) Enable Please note that this will terminate the current network-side session
Block Network-side Web Management Access (HTTPS) Enable
Block Network-side FTP Access Enable
Block Network-side SFTP Access Enable
Block Network-side SSH Shell Access Enable
Block Subscriber-side Interfaces
Block Subscriber-side Telnet Access Enable
Block Subscriber-side Web Management Access (HTTP) Enable Please note that this will terminate the current subscriber-side session
Block Subscriber-side Web Management Access (HTTPS) Enable
Block Subscriber-side FTP Access Enable
Block Subscriber-side SFTP Access Enable
Block Subscriber-side SSH Shell Access Enable
Source IP-based Access Control
Access Control Enable
NOTE: You must reboot for setting changes to take effect.
Reboot after changes are saved? Yes
Submit Reset
Please enter an IP address/range:
Note: Up to 50 Access Control IP addresses/ranges can be entered.
Note: Please make sure to enter the correct addresses.
Access Control Start IP:
Access Control End IP: None
Add Remove
Currently Access is Permitted for IP's:
172.30.30.173
Number of Access Control Addresses/Ranges: 1

2. For **Configurable Ports**, enter a **Telnet Port** and an **HTTP Port**.
3. Enable or disable administrator access to any of the following interfaces:

- **Telnet Access**
- **Web Management Access (HTTP)**
- **Web Management Access (HTTPS)**
- **FTP Access**
- **SFTP Access**
- **SSH Shell Access**

Blocking or unblocking interface access will terminate the current session.

Do not enable the blocking of all interfaces without setting up and enabling SNMP. Enabling the blocking of all interfaces and disabling SNMP will completely block access to the Access Gateway administration interface. For assistance, contact Nomadix Technical Support.

4. Enable or disable subscriber-side interface blocking for any of the following interfaces
   - **Telnet Access:** enables/disables blocking of Telnet access from the subscriber-side to the NSE Telnet interface. Default setting is enabled.
   - **Web Management Access (HTTP):** enables/disables blocking of Web Management access from the subscriber-side to the NSE WMI. Default setting is enabled.
   - **Web Management Access (HTTPS):** enables/disables blocking of secure Web Management access from the subscriber-side to the NSE WMI. Default setting is enabled.
   - **FTP Access:** enables/disables blocking of FTP access from the subscriber-side to the NSE. Default setting is enabled.
   - **SFTP Access:** enables/disables blocking of SFTP access from the subscriber-side to the NSE. Default setting is enabled.
   - **SSH Shell Access:** enables/disables blocking of SSH shell access from the subscriber-side to the NSE CLI. Default setting is disabled.
5. Click the check box for **Access Control** if you want to enable this feature, then click on the **Submit** button to save your change.

   If you enabled Access Control, administrator access is restricted only to the IP addresses shown under the “Currently Access is Permitted for IPs” listing. If you want to add to or remove IP addresses from the list, go to Step 6 through Step 8.

The Access Control list can contain up to 50 (fifty) valid administrator IP addresses or ranges of IP addresses.

6. To add an IP address (or range of IP addresses) to the list, enter the “starting” IP address in the **Access Control Start IP** field.
7. If you are adding a range of IP addresses to the access control list, you must now enter the “ending” IP address in the **Access Control End IP** field. If you are adding a single IP address, enter **None** in the **Access Control End IP** field.
8. Click on the **Add** button to add the IP address (or range of IP addresses) to the list.
9. To remove an IP address (or range of IP addresses) from the list, enter the “starting” IP address in the **Access Control Start IP** field.

   If you are removing a range of IP addresses from the access control list, you must now enter the “ending” IP address in the **Access Control End IP** field. If you are removing a single IP address, enter **None** in the **Access Control End IP** field.
10. Click on the **Remove** button to remove the IP address (or range of IP addresses) from the list.

If you enabled Access Control and have “locked yourself out,” of the system (for example, because you’ve forgotten your password), you must establish a local serial connection with the CLI to disable the Access Control feature, or change the range of allowed IP addresses to access the management interfaces. If you have changed the serial port to act as a PMS interface, please contact Nomadix technical support. In this case, refer to “Contact Information” on page 349**.**

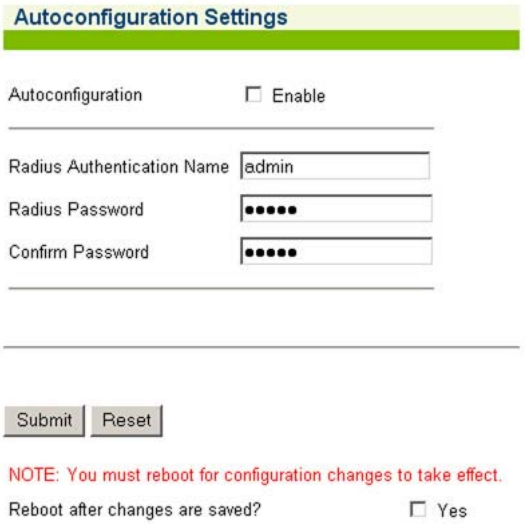
Defining Automatic Configuration Settings {Auto Configuration}

The Access Gateway allows you to define parameters to enable the automatic configuration of the system. See also, “RADIUS-driven Auto Configuration” on page 21.

A Radius VSA supports assigning specific users to specific WAN interface.

- VSA ID: 24
- VSA Name: Nomadix-Preferred-WAN
- VSA Value: Either WAN, Eth1, Eth2, Eth3, Eth4, or Eth5 to identify what interface the user will try to send traffic on. (The interface will internally select properly on the 5600 and 2400).

1. From the Web Management Interface, click on **Configuration**, then **Auto Configuration**. The *Autoconfiguration Settings* screen appears:



2. Enable or disable **Autoconfiguration**, as required.
3. If you enabled *Autoconfiguration*, you must enter the following information into the corresponding fields:
   - RADIUS Authentication Name
   - RADIUS Password
   - Confirm Password
4. Click on the check box for **Reboot after changes are saved?** to reboot the system when you submit your changes.
5. Click on the **Submit** button to save your changes, or click or the **Reset** button to reset all data to its previous state.

See Enabling Auto Configuration.

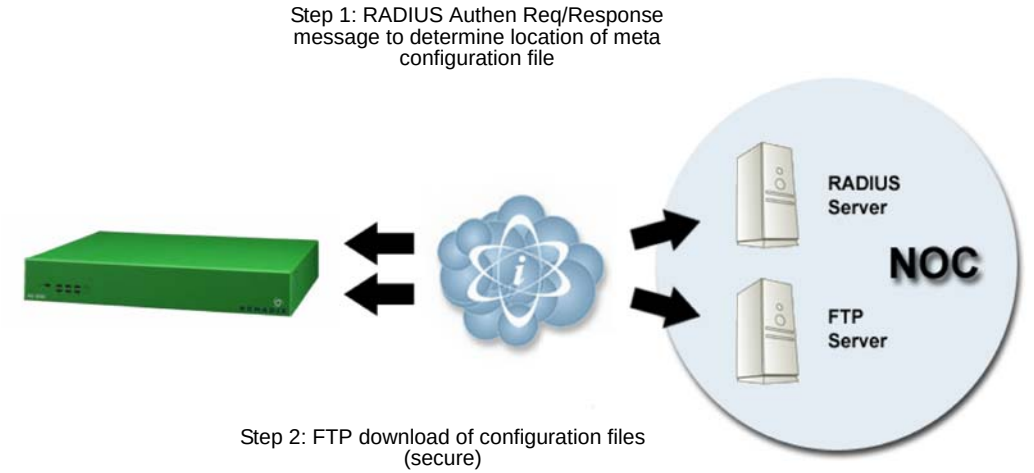
Enabling Auto Configuration

As shown in the diagram below, two subsequent events drive the automatic configuration of Nomadix devices:

1. A flow of RADIUS Authentication Request and Reply messages between the Nomadix gateway and the centralized RADIUS server that specifies the location of the meta

configuration file (containing a listing of the individual configuration files and their download frequency status) are downloaded from an FTP server into the flash of the Nomadix device.

2. Defines the automated login into the centralized FTP server and the actual download process into the flash.


Step 1: RADIUS Authen Req/Response message to determine location of meta configuration file
RADIUS Server
NOC
FTP Server
Step 2: FTP download of configuration files (secure)

The Auto-Configuration setup requires a few basic steps to be completed by both the field engineer and the NOC administrator.

Administrative Steps to Enable Auto-Config

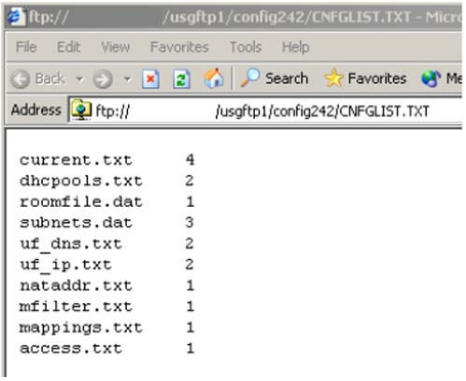
Typically, these tasks are performed either at a device pre-staging center or by the field engineer.

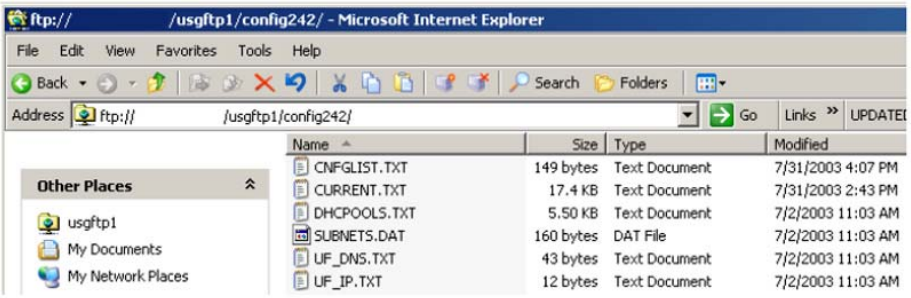
1. Establish a WAN connection and electronically accept the EULA.
2. Setup RADIUS Server parameters (go to "Defining the Realm-Based Routing Settings {Realm-Based Routing}" on page 158).
3. Setup Username and Password for RADIUS Authentication.

Administrative Steps to Enable Auto-Config for the NOC Administrator:

1. Add NAS IP address.
2. Add Nomadix Auto-Config VSA to the Nomadix dictionary file on the RADIUS server.
3. Create a RADIUS profile with the configuration VSA.
4. Create an FTP server with the configuration files.

5. The following diagram shows a sample RADIUS configuration file, meta file and illustration of the FTP server setup.




ftp:// /usgftp1/config242/ - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Folders
Address ftp:// /usgftp1/config242/
Go Links
Other Places
usgftp1
My Documents
My Network Places
Name Size Type Modified
CNFGLIST.TXT 149 bytes Text Document 7/31/2003 4:07 PM
CURRENT.TXT 17.4 KB Text Document 7/31/2003 2:43 PM
DHCPOOLS.TXT 5.50 KB Text Document 7/2/2003 11:03 AM
SUBNETS.DAT 160 bytes DAT File 7/2/2003 11:03 AM
UF_DNS.TXT 43 bytes Text Document 7/2/2003 11:03 AM
UF_IP.TXT 12 bytes Text Document 7/2/2003 11:03 AM

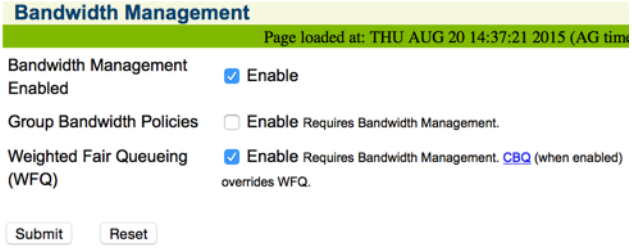
The Nomadix device will automatically initiate one reboot to enable the new settings. Configuration updates for network maintenance can be accomplished by simply enabling the Auto-Configuration option and rebooting the device (for example, using SNMP). See also, Defining Automatic Configuration Settings {Auto Configuration}.

Setting Up Bandwidth Management {Bandwidth Management}

The Access Gateway allows system administrators to manage the bandwidth for subscribers, defined in Kbps (Kilobits per seconds) for both upstream and downstream data transmissions. With the ICC feature enabled, subscribers can increase or decrease their own bandwidth dynamically, and also adjust the pricing plan for their service.

You can enable or disable bandwidth policies for bandwidth management and group bandwidth management policies. You can specify settings for each individual WAN.

1. From the Web Management Interface, click on **Configuration**, then **Bandwidth Management**. The *Bandwidth Management* screen appears:



2. If required, click the check box for **Bandwidth Management Enabled**.
3. If required, select Group Bandwidth Policies. Bandwidth Management must be enabled before you can enable and specify Group Bandwidth Policies.

Note: The Bandwidth Management page only globally Enables and Disables Bandwidth Management and Group Bandwidth Policies. Bandwidth settings themselves are set for each WAN interface in Ethernet Ports/WAN.

4. If you made any changes to the settings on this screen, you must click the check box for **Reboot after changes are saved?** (the Access Gateway must be rebooted).
5. Click on the **Submit** button to save your changes and reboot the system, or click on the **Reset** button if you want to reset all the values to their previous state.

Group Bandwidth Limit Policy

The Group Bandwidth Limit Policy allows the you to assign a common bandwidth rate limiting policy to a group of subscriber devices. All devices within the group share the total bandwidth allocated to the policy.

The Group Bandwidth Limit Policy feature defines the following vendor-specific attributes (VSAs):

Nomadix VSA #	Name	Role/Value
19	GROUP_BW_POLICY_ID	Defines the ID the for the group policy. Integer between 1 and 16777215, inclusive.

20	GROUP_BW_MAX_UP	Defines the total upstream bandwidth allowed for the group in Kilobits per second. Integer value. 0 is interpreted as unlimited.
21	GROUP_BW_MAX_DOWN	Defines the total downstream bandwidth allowed for the group in Kilobits per second. Integer value. 0 is interpreted as unlimited.

Group Bandwidth Limit Policy – Operation

The NSE maintains a collection of all installed group bandwidth policies. The collection is indexed by the bandwidth policy ID provided by the RADIUS server. The collection can store as many policy records as the number of licensed subscriber devices. All subscriber devices sharing the same group bandwidth policy ID belong to the same group. A subscriber device can participate in only one bandwidth-limiting group at a time.

When a login is performed to an account that returns a bandwidth policy ID that does not yet exist in the NSE, a new policy record is created and inserted into the aforementioned collection. The subscriber authorized by the Access-Accept is associated with the newly installed bandwidth policy ID, and the bandwidth limits returned are invoked.

When the Access-Accept for a subscriber contains a bandwidth policy ID already present on NSE, the subscriber is associated with the existing group policy. All subscribers that are now members of the group share the total bandwidth allocated to the policy.

If at some point a login is performed to an account that returns the policy ID for an existing policy, but also returns bandwidth values different than those currently allocated for that policy, the policy will be updated with the new values found in the Access-Accept. Thus, the latest Access-Accept determines the current rates for the entire group.

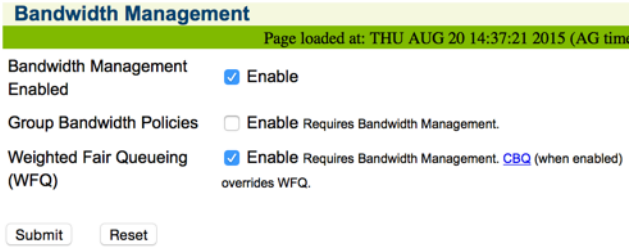
The lifetime of a group policy record in the collection is determined by the session time of the authorized (i.e. VALID) subscribers participating in the group. Group policy records are removed from the collection when the last subscriber device belonging to the group is logged out of the NSE regardless of the reason (e.g. session timeout, idle timeout, deletion of the subscriber by an administrator, etc).

The NSE does not support the ability to enforce both per-subscriber and group bandwidth rates simultaneously for the same subscribers. The RADIUS server must specify either per-subscriber or group bandwidth attributes. However, in case a RADIUS Access-Accept contains both individual and group bandwidth attributes, *the NSE will use the group attributes and ignore the per-subscriber attributes*.

The NSE can concurrently support some subscribers as part of a group and some others with limits set on a per-subscriber basis. However, a single subscriber cannot be assigned group membership and individual limits at the same time.

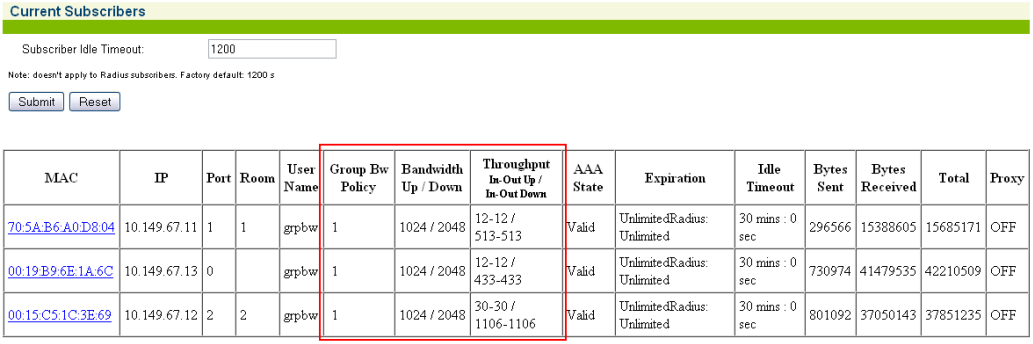
Group Bandwidth Limit Policy – Enable

The Group Bandwidth feature is globally enabled via an option on the Bandwidth management page. You can also enable Weighted Fair Queueing from this screen. See "Weighted Fair Queueing" on page 26.



Group Bandwidth Limit Policy – Current Table

When the feature is enabled, a group bandwidth policy ID column is displayed in the current table. Once policies are instantiated, policy information can be viewed via XML.



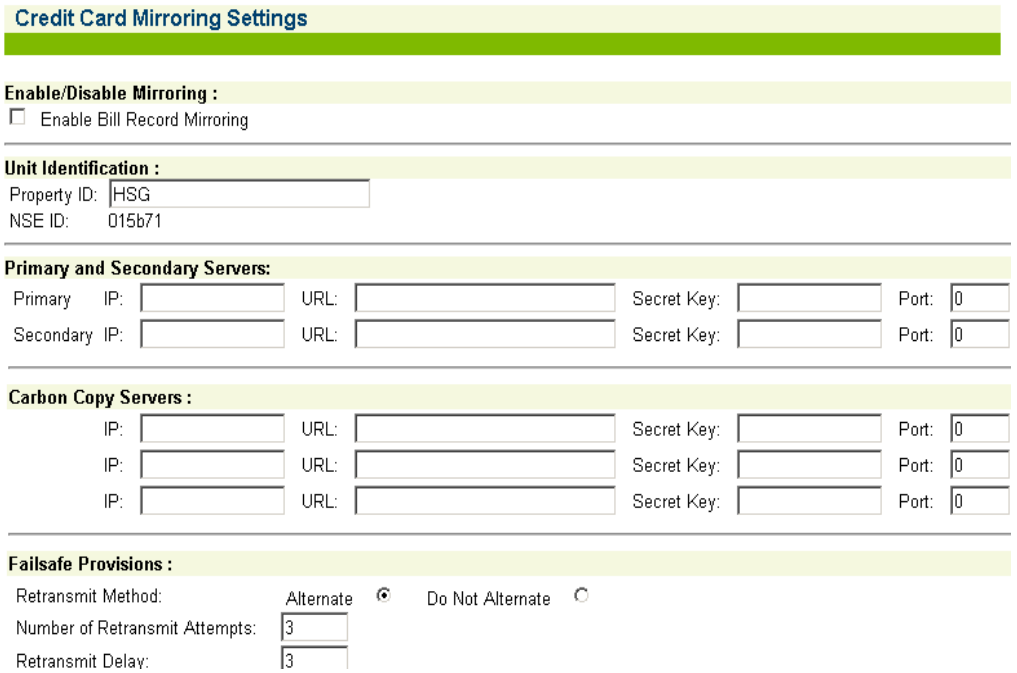
MAC	IP	Port	Room	User Name	Group Bw Policy	Bandwidth Up / Down	Throughput In-Out Up / In-Out Down	AAA State	Expiration	Idle Timeout	Bytes Sent	Bytes Received	Total	Proxy
70:5A:B6:A0:D8:04	10.149.67.11	1	1	grpbw	1	1024 / 2048	12-12 / 513-513	Valid	UnlimitedRadius: Unlimited	30 mins : 0 sec	296566	15388605	15685171	OFF
00:19:B9:6E:1A:6C	10.149.67.13	0		grpbw	1	1024 / 2048	12-12 / 433-433	Valid	UnlimitedRadius: Unlimited	30 mins : 0 sec	730974	41479535	42210509	OFF
00:15:C5:1C:3E:69	10.149.67.12	2	2	grpbw	1	1024 / 2048	30-30 / 1106-1106	Valid	UnlimitedRadius: Unlimited	30 mins : 0 sec	801092	37050143	37851235	OFF

Establishing Billing Records "Mirroring" {Bill Record Mirroring}

The Access Gateway can send copies of credit card transaction and PMS billing records to external servers that have been previously defined by system administrators. The Access Gateway assumes control of billing transmissions and saving billing records. By "mirroring" the billing data, theAccess Gateway can also send copies of billing records to predefined "carbon copy" servers. Additionally, if the primary and secondary servers are down, the Access Gateway can store up to 2,000 credit card transaction records. When a connection is re-established (with either server), the Access Gateway sends the stored information to the server—*no records are lost!*

For more information about the bill record mirroring feature, go to "Mirroring Billing Records" on page 338.

1. From the Web Management Interface, click on **Configuration**, then **Bill Record Mirroring**. The *Credit Card/PMS Mirroring Settings* screen appears:


Credit Card Mirroring Settings
Enable/Disable Mirroring :
Enable Bill Record Mirroring
Unit Identification :
Property ID: HSG
NSE ID: 015b71
Primary and Secondary Servers:
Primary IP: URL: Secret Key: Port: 0
Secondary IP: URL: Secret Key: Port: 0
Carbon Copy Servers :
IP: URL: Secret Key: Port: 0
IP: URL: Secret Key: Port: 0
IP: URL: Secret Key: Port: 0
Failsafe Provisions :
Retransmit Method: Alternate Do Not Alternate
Number of Retransmit Attempts: 3
Retransmit Delay: 3

2. If you want to enable the billing records "mirroring" functionality for credit card transactions, click on the check box for **Enable Bill Record Mirroring**.

3. Enter the property identification code in the **Property ID** field.
4. Enter the communication parameters for the primary server that is to be used for mirroring, including:
   - Primary IP
   - URL
   - Secret Key

The Access Gateway and the "mirror" servers must use the same secret key.

5. Repeat Step 4 for the secondary server (if any) and all carbon copy servers.
6. Define the "fail-safe" provisions, including:
   - Retransmit Method – Alternate, or do not alternate.
   - Number of Retransmit Attempts – This tells the system how many times it should attempt to retransmit billing records before suspending the task.
   - Retransmit Delay – This specifies the time delay between each retransmission.
7. Click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset all the values to their previous state.

Class-Based Queueing

Nomadix Class-Based Queueing provides a flexible way to control the bandwidth provided to individual groups of users (classes). Classes have both maximum and minimum bandwidth specifications.

You can add users to classes and apply attributes across entire classes. Each class has 3 configurable attributes:

- Priority
- Minimum Bandwidth
- Maximum Bandwidth

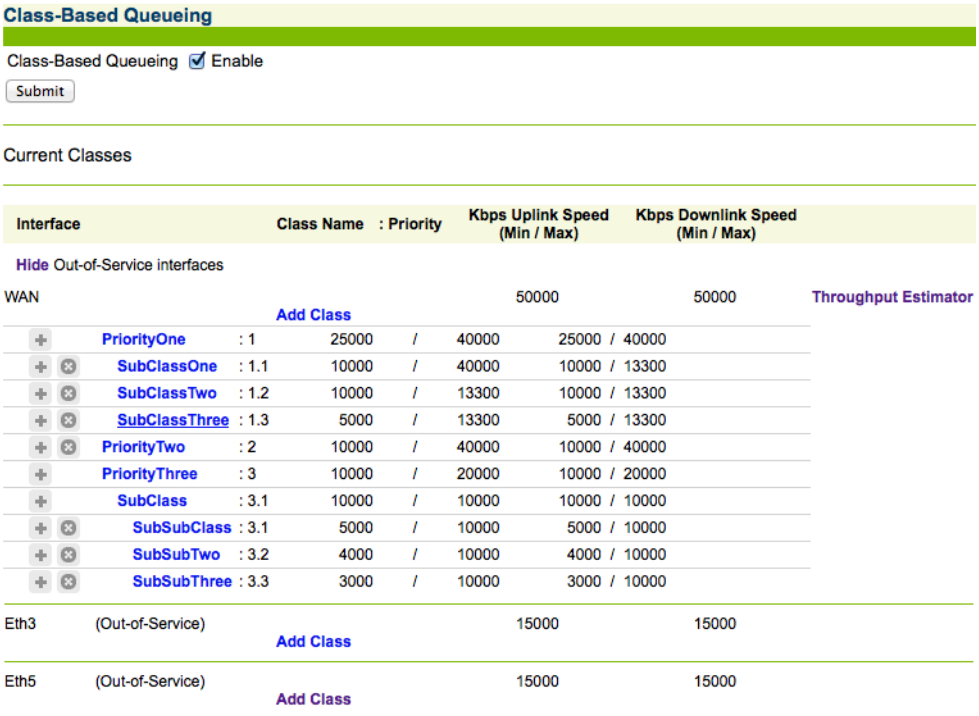
Attributes are applied only when there is contention between users in different classes for available bandwidth.

For additional details, see "Class-Based Queueing" on page 11.

To Enable and Configure Class-Based Queueing

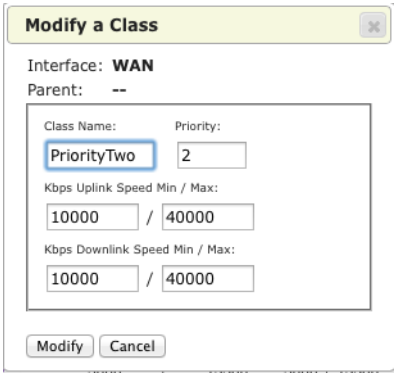
1. Click **Configuration** > **Class Based Queueing**

   The Class Based Queueing screen appears.

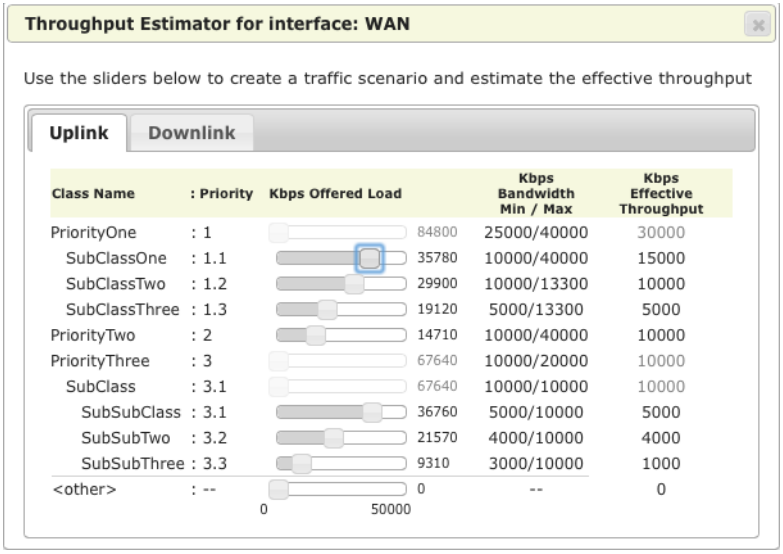

Class-Based Queueing
Class-Based Queueing Enable
Submit
Current Classes
Interface
Class Name : Priority
Kbps Uplink Speed (Min / Max)
Kbps Downlink Speed (Min / Max)
Hide Out-of-Service interfaces
WAN
50000
50000
Throughput Estimator
Add Class
PriorityOne : 1 25000 / 40000 25000 / 40000
SubClassOne : 1.1 10000 / 40000 10000 / 13300
SubClassTwo : 1.2 10000 / 13300 10000 / 13300
SubClassThree : 1.3 5000 / 13300 5000 / 13300
PriorityTwo : 2 10000 / 40000 10000 / 40000
PriorityThree : 3 10000 / 20000 10000 / 20000
SubClass : 3.1 10000 / 10000 10000 / 10000
SubSubClass : 3.1 5000 / 10000 5000 / 10000
SubSubTwo : 3.2 4000 / 10000 4000 / 10000
SubSubThree : 3.3 3000 / 10000 3000 / 10000
Eth3
(Out-of-Service)
15000
15000
Add Class
Eth5
(Out-of-Service)
15000
15000
Add Class

2. Click **Enable** and then **Submit** to enable Class-Based Queueing.
3. Click **Add Class** to add a class. Class names are case-sensitive. “Dot” notation (e.g., **`<top-level class>.<subclass>`**) is used to associate top-level classes and subclasses.
   - Subscribers can only be assigned to sub-classes.
   - Sub-classes cannot access bandwidth greater than their assigned WAN link.
   - Top-level classes can be assigned a priority of 1 through 8. Sub-classes can be assigned a priority of 1, 2, or 3. One is the highest priority.
   - Minimum bandwidths are respected regardless of priority. Minimums/maximum bandwidth is applied across all users in a class.

4. Click on a class name to change the class name or modify the attributes of a class.



5. Click **Throughput Estimator** to evaluate traffic scenarios. Given different loads per class, the interface provides the estimated effective throughput. You can use this tool to preview how bandwidth will be assigned,, based on Class-Based Queueing structure and priority settings.


Throughput Estimator for interface: WAN
Use the sliders below to create a traffic scenario and estimate the effective throughput
Uplink
Downlink
Class Name
: Priority
Kbps Offered Load
Kbps Bandwidth Min / Max
Kbps Effective Throughput
PriorityOne : 1 84800 25000/40000 30000
SubClassOne : 1.1 35780 10000/40000 15000
SubClassTwo : 1.2 29900 10000/13300 10000
SubClassThree : 1.3 19120 5000/13300 5000
PriorityTwo : 2 14710 10000/40000 10000
PriorityThree : 3 67640 10000/20000 10000
SubClass : 3.1 67640 10000/10000 10000
SubSubClass : 3.1 36760 5000/10000 5000
SubSubTwo : 3.2 21570 4000/10000 4000
SubSubThree : 3.3 9310 3000/10000 1000
<other> : -- 0 -- 0
0
50000

Assigning Users to a Class

There are four ways to assign users to a particular class:

- Radius

- XML
- Subscriber Administration menu
- Subscriber Interface menu

Assigning a User to Class-Based Queueing Using Radius

Subscribers can be assigned to a specific class/sub-class using Radius VSA. Subscribers with no class membership are assigned a priority of 8.

```
ATTRIBUTE Nomadix-Bw-Class-Name 27 string
```

For example, when a subscriber logs in and this attribute is defined as follows, the subscriber gets assigned to the class **`priority1.Subclass`**.

```
Nomadix-Bw-Class-Name = "priority1.Sub-class"
```

Assigning a user to a class using XML

The **`CLASS_NAME`** element has been added to the **`USER_ADD`** and **`USER_PAYMENT`** XML commands. These are covered in the 8.4 XML DTD documentation, available from www.nomadix.com/support.

Assigning a User to a Class using the Subscriber Administration menu

The procedures for Adding Subscriber Profiles (**Subscriber Administration** > **Add)** support adding a subscriber, device, or group account profile to a class. See “Adding Subscriber Profiles {Add}” on page 203.

Assigning a User to a Class Using Bill Plans (Subscriber Interface menu)

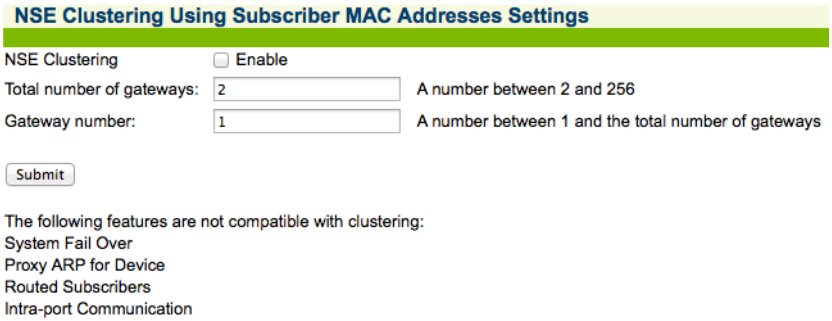
You can add a user to a class while setting up a billing plan. See “Setting Up a “Normal” Billing Plan” on page 221.

Clustering {Clustering}

NSE Clustering provides the ability to cluster multiple gateways on one network segment. For more information about this feature, including description, limitations, and troubleshooting information, see “Multiple Unit Clustering” on page 31.

To enable NSE Clustering:

1. Click **Configuration** > **Clustering** and click **Enable**.



2. Enter integers for the Total number of gateways and the Gateway number (must be from 2 to 256 with no gaps). For example, if clustering is being configured on three gateways, one gateway must be 1, one gateway must be 2 and one gateway must be 3.

Be aware of the following:

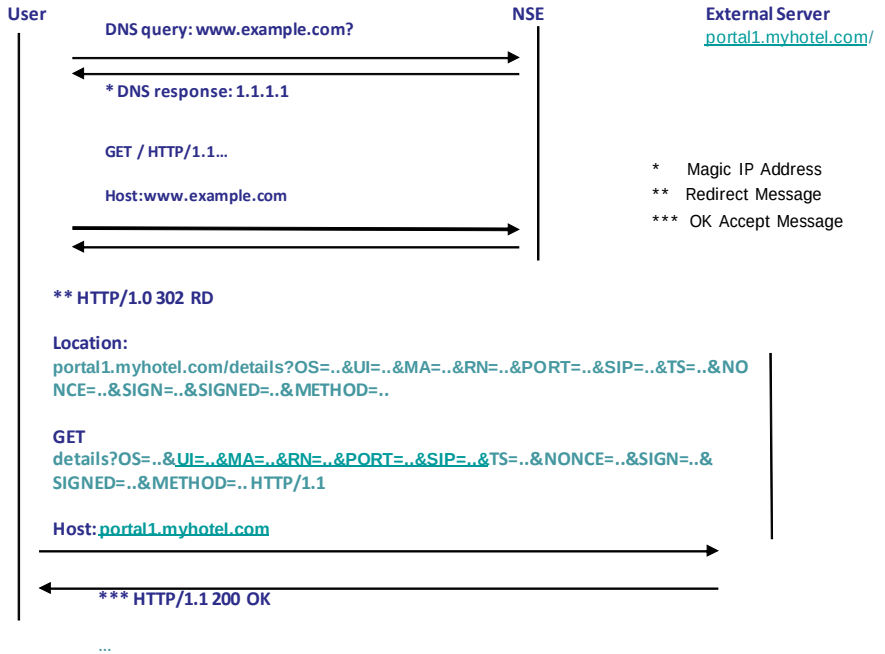
- All gateways in a cluster must have the same configuration
- WAN and INAT IP addresses must not clash among clustered gateways
- All gateways must have the same number of licensed subscribers
- No restrictions are placed on shared secrets, administrator credentials, RADIUS NAS identifier and NAS port.

Configuring Destination HTTP Redirection {Destination HTTP Redirection}

Destination HTTP Redirect provides DNS-triggered redirection of HTTP requests to one or more portal page URLs configured on the NSE. Portal pages could include account status, maps, local information, etc.

The NSE will intercept and respond to DNS queries containing configurable strings. Subscribers requesting a website at that DNS will obtain a DNS response that contains a “magic” IP address (which is the same value obtained when the subscriber queries the DNS string “logout.nomadix.com”).

The NSE will process HTTP requests for that “magic” IP address (configurable on the AAA page), and will reply with an HTTP redirection (which may include a number of signed redirection parameters) to a configured URL. By following the HTTP redirection, the subscriber will reach the target URL, and he/she will then be served a page containing whatever information is relevant (account and/or other specific information).



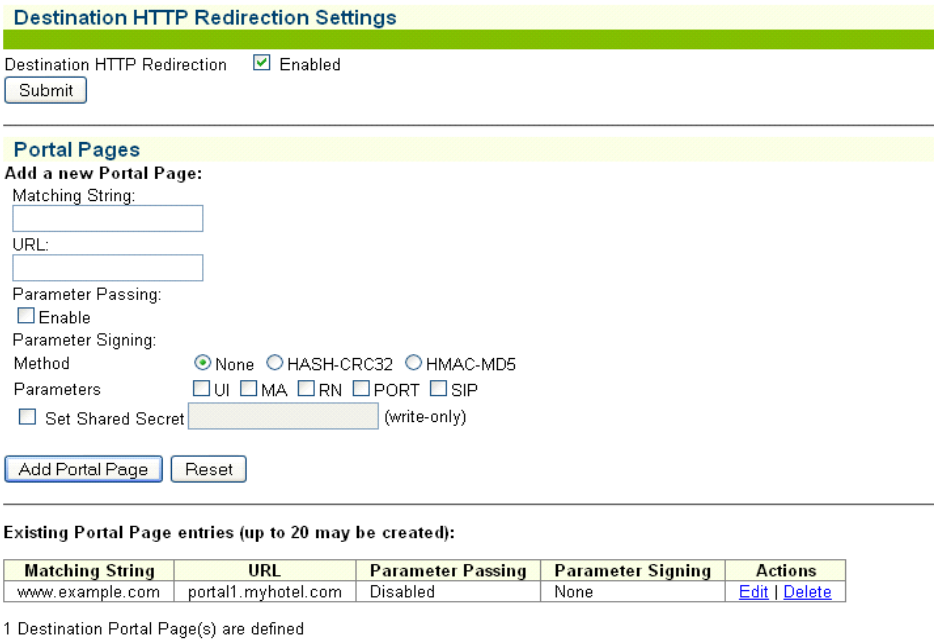
The figure above illustrates destination HTTP redirection, assuming a DNS query string for www.example.com, a magic IP address of 1.1.1.1, and a portal page URL of portal1.myhotel.com. Given this configuration, the following would apply:

- A DNS query for www.example.com is intercepted by the NSE, which responds with the magic IP address. Then, the subscriber's browser sends an HTTP request to the magic IP and sets the Host header to www.example.com.
- The NSE will process the HTTP request and will analyze the Host header to find the redirection URL that corresponds to www.example.com, which is portal1.myhotel.com in this example. The NSE will then craft an HTTP redirection response that contains the portal page URL, followed by a query string. The string will include various redirection parameters, time-stamped and signed, if signing is enabled for that entry (which it is not in this example).
- The subscriber will follow the redirection string and will land on the portal page URL. The portal will verify and analyze the query string and then will return the relevant information (likely about the subscriber's account status, depending on what the portal is configured to handle).

- After successful redirection occurs the list of signed parameters and signature methods are passed to the portal page.

  HTTP/1.0 302 RD http://portal1.myhotel.com/details?OS=<Original Server>&UI=<NSE's ID>&MA=<subscriber's MAC>&RN=<Room name>&PORT=<VLAN>&SIP=<subscriber's IP>&TS=<timestamp>&NONCE=<16 chars>&SIGN=<signature>& SIGNED=<list of signed parameters>& METHOD=<signature method>

1. From the Web Management Interface, click on **Configuration**, then **Destination HTTP Redirection**. The *Destination HTTP Redirection Settings* screen appears:



2. To enable Destination HTTP Redirection, click on the **Enabled** check box. The default setting is disabled.

   You may create up to 20 portal pages.

3. In the **Portal Pages** section, enter the matching string that will be directed to the portal page in the **Matching String** field.

4. Enter the portal page's URL in the **URL** field.

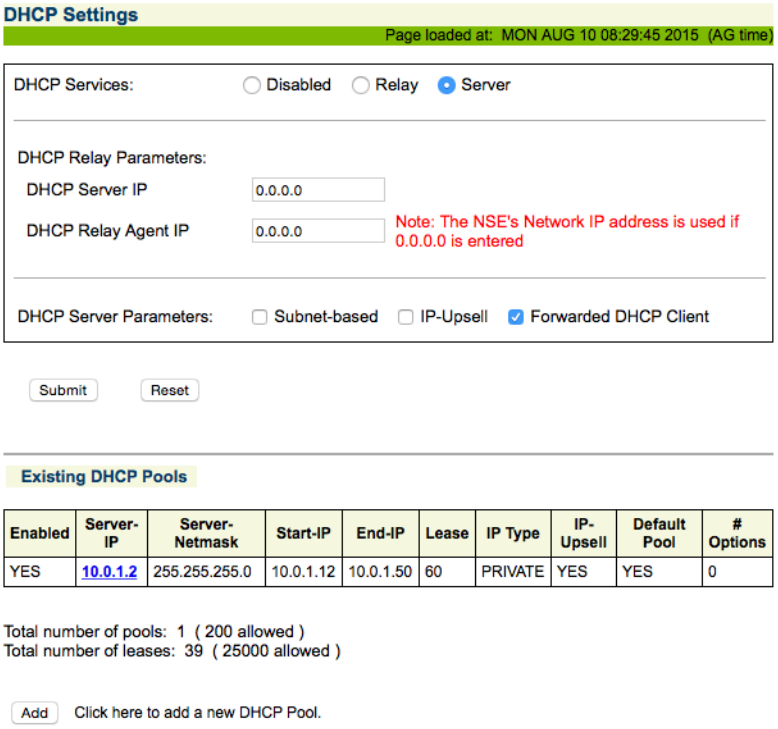
5. To enable parameter passing, click on the Parameter Passing **Enable** check box.
6. Select the **Parameter Signing**:
   - **Method**:
     None, **HASH-CRC32**, or **HMAC-MD5** (select one method).
   - **Parameters**:
     UI, **MA**, **RN**, and **PORT** (select all applicable parameters).
7. To enable Set Shared Secret, click on the **Set Shared Secret** check box. If you enable this feature, enter the shared secret text string in the **Set Shared Secret** field.
8. Click on the **Submit** button to save the redirection settings, or click on the **Reset** button if you want to reset all the values to their previous state.

   Portal page setting are saved to the table in **Existing Portal Page entries** section of the screen. From that table, you can edit or delete existing portal pages

Managing the DHCP service options {DHCP}

When a device connects to the network, the DHCP server assigns it a “dynamic” IP address for the duration of the session. Most users have DHCP capability on their computer. To enable this service on the Access Gateway, you can either enable the DHCP relay (routed to an external DHCP server IP address), or you can enable the Access Gateway to act as its own DHCP server. In both cases, DHCP functionality is necessary if you want to automatically assign IP addresses to subscribers.

1. From the Web Management Interface, click on **Configuration**, then **DHCP**. The *DHCP Settings* screen appears:



Nomadix' patented Dynamic Address Translation (DAT) functionality is automatically configured to facilitate "plug-and-play" access to subscribers who are misconfigured with static (permanent) IP addresses, or subscribers that do not have DHCP capability on their computers. DAT allows all users to obtain network access, regardless of their computer's network settings.

2. **DHCP Services** is enabled by default. Do not disable it unless you want to lose all your DHCP services.

   By default, the Access Gateway is configured to act as its own DHCP server and the relay feature is disabled. If you want the Access Gateway to act as its own DHCP server, do not enable the relay. Go directly to Step 8.

3. To route DHCP through an external server, enable the **DHCP Relay**.
4. If you enabled the DHCP Relay feature, you must assign a valid **DHCP Server IP** address (the default is 0.0.0.0) and a valid **DHCP Relay Agent IP** address.

The DHCP Relay Agent allows the Access Gateway to request a specific range of IP addresses from different IP pools from the DHCP Server. Leaving these fields blank forces the system to use the IP pool that contains IP addresses that are on the same subnet as the Access Gateway.

You must disable the DHCP server before enabling the DHCP relay. Both features cannot be enabled concurrently.

If the DHCP Relay Agent IP address is set for an address that is already used or the IP address of the server, the other system will get an IP conflict and will not have Internet access.

5. If you want the Access Gateway to act as its own **DHCP Server** (you did not enable the *DHCP Relay*), enable it now.
6. If required, you can make the DHCP Server feature **Subnet -based** by checking the appropriate box.
7. If required, enable the **IP Upsell** feature.

   System administrators can set two different DHCP pools for the same physical LAN. When DHCP subscribers select a service plan with a public pool address, the Access Gateway associates their MAC address with their public IP address for the duration of the service level agreement. The opposite is true if they select a plan with a private pool address. This feature enables a competitive solution and is an instant revenue generator for ISPs. The IP Upsell functionality solves a number of connectivity problems, especially with regard to certain video conferencing and online gaming applications.

   The NSE provides additional flexibility for configuring upsell scenarios. Users can be assigned WAN's of different bandwidth capabilities; for example, for hotel guests of stature or for premium payment.

8. If you want to add a new DHCP Pool, click on the **Add** button. The *Add DHCP Pools* screen appears:

Add DHCP Pools
DHCP Server IP
DHCP Server Netmask
DHCP Pool Start IP
DHCP Pool Stop IP
DHCP Lease Minutes
Public Pool
Private Pool
IP Upsell Pool
Default Pool
DHCP Options
Router:
DHCP Server IP
Specify:
Add
Note: Please make sure pools do not overlap.
Back to Main DHCP Configuration Page
Available NIS Services
Nomadix Support Services -- Software, hardware and call center support for your NSE Gateway
SMTP Relay -- Application prioritization service designed to limit SMTP (SPAM) abuse

9. Enter a valid **DHCP Server IP** address for the DHCP server.
10. Enter the **DHCP Server Netmask**.
11. Enter the starting and ending IP addresses for the DHCP address pool you want to use:
    - DHCP Pool Start IP
    - DHCP Pool Stop IP
12. Enter the **DHCP Lease Minutes**.
13. Select **Public Pool** or **Private Pool**, as required.

    A "public" IP address will not be translated by DAT.

14. If required, make this an **IP Upsell Pool** and/or the **Default Pool** by checking the appropriate boxes.

    Do not allow pools to overlap.

15. Optional, if the gateway router for the DHCP Pool is other than that of the DHCP Server IP, select **Specify** and enter the IP address of the gateway router of choice.
16. When finished establishing your DHCP Pools, click on the **Back to Main DHCP Configuration Page** to return to the previous page.
17. You must now reboot the system for the new settings to take effect. Click the check box for **Reboot after changes are saved?** then click on the **Submit** button to save your changes and reboot the system, or click on the **Reset** button if you want to reset all the values to their previous state.

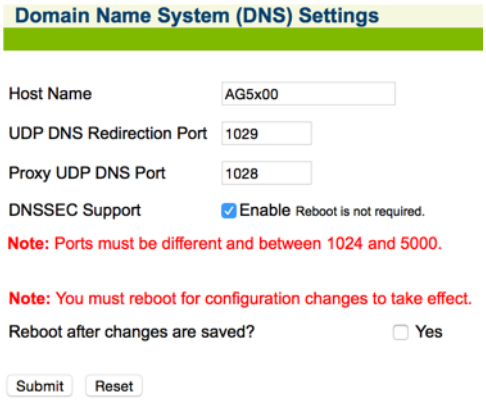
    The existing lease pool and lease table are deleted and the Access Gateway reboots. The Access Gateway can issue IP addresses to any DHCP enabled subscriber who enters the network.

Enabling DNSSEC Support

DNSSEC support adds authentication and integrity capability to DNS systems. The DNSSEC feature in the NSE allows DNSSEC queries and responses to traverse the NSE between subscribers and the NSE's configured DNS servers. The NSE itself does not participate in DNSSEC trust relationships with subscribers. Reboot is not required.

Use the following procedure to set the DNS configuration options.

1. From the Web Management Interface, click on **Configuration**, then **DNS**. The *Domain Name System (DNS) Settings* screen appears:



2. Check the **Enable** check box to enable DNSSEC Support functionality. The default setting is disabled.
3. Click on the **Submit** button to save your changes (reboot is not required), or click on the **Reset** button if you want to reset all the values to their previous state.

Managing the DNS Options {DNS}

DNS allows subscribers to enter meaningful URLs into their browsers (instead of complicated numeric IP addresses) by automatically converting the URLs into the correct IP addresses. You can assign a primary, secondary, or tertiary (third) DNS server. The Access Gateway utilizes whichever server is currently available.

Use the following procedure to set the DNS configuration options.

1. From the Web Management Interface, click on **Configuration**, then **DNS**. The *Domain Name System (DNS) Settings* screen appears:
2. Enter the **Host Name** (the DNS name of the Access Gateway).

The host name must not contain any spaces.

3. Enter a valid **Domain** name (the Internet domain that DNS requests will utilize).
4. Enter the IP addresses for the DNS servers (located at the customer's network operating center where DNS requests are sent). Servers include:
   - Primary DNS Server
   - Secondary DNS Server
   - Tertiary DNS Sever

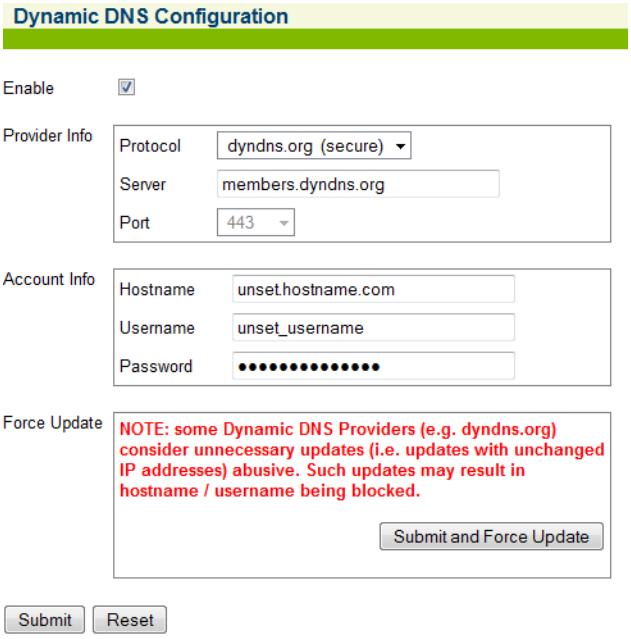
The secondary and tertiary DNS servers are only utilized if the primary DNS server is unavailable.

5. Enter a **DNS Redirection Port** and a **Proxy DNS Port**.
6. When finished, you must reboot the system for the new settings to take effect. Click on the check box for **Reboot after changes are saved?** to reboot the system after saving your changes.
7. Click on the **Submit** button to save your changes and reboot the system, or click on the **Reset** button if you want to reset all the values to their previous state.

Managing the Dynamic DNS Options {Dynamic DNS}

Use the following procedure to set the Dynamic DNS options.

1. From the Web Management Interface, click **Configuration**, then **Dynamic DNS**. The *Dynamic DNS Configuration* screen appears:



2. Check the **Enable** checkbox to enable Dynamic DNS (DDNS) functionality. The default setting is disabled.
3. Enter the **Provider Info**:
   - Select the provider protocol from the **Protocol** menu. Currently, only **dyndns.org** and **dyndns.org (secure)** are supported. The default setting is **dyndns.org (secure)**.
   - In the **Server** field, enter the server name to which the client sends updates to the DDNS server.
   - Select the port number for the server from the **Port** menu.
4. Enter the **Account Information**:
   - Enter the host name, which is the DDNS name that is mapped to the client IP address, in the **Hostname** field. DDNS mapping is configured on the DynDNS.org account.
   - Enter the user name for the DDNS server account in the **Username** field.
   - Enter the password name for the DDNS server account in the **Password** field.

5. In the **Force Update** field, click **Submit and Force Update** to force an immediate update to the DDNS.

   Note that too many updates may be considered abuse by the DDNS vendor.

   Alternatively, click **Submit** to save the settings or **Reset** to clear the changes and return the settings to the previous state.

Ethernet Ports/WAN

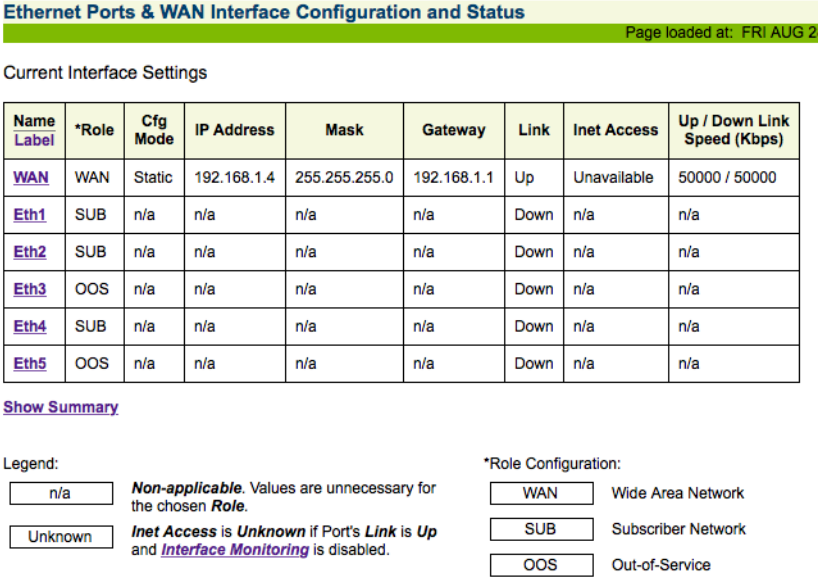
The NSE supports multiple, separately configurable WAN interfaces. You may assign each interface as a WAN, Subscriber Interface, or specify that it remain out of service. Each interface has its own IP, DNS, Bandwidth, VLAN, and NAT IP addresses, and can obtain its IP address by DHCP, PPPoE, or Static configuration.

The number of configurable WANs will vary with the Access Gateway hardware. See "Product Specifications" on page 298 for these details.

The NSE can now support up to five (AG5800) WAN interfaces at once, using completely independent network settings for each.

- Each WAN port has independent Mode, IP, DNS, iNAT, Monitoring, Additional NAT addresses, 802.1Q tagging, and bandwidth settings.
- Roles for most ports (those marked either EthX or AuxX) are unrestricted; that is, each port can be set to
  - WAN Network Side Link
  - SUB (Subscriber), or
  - OOS (Out Of Service).
- However, designated WAN or LAN ports cannot be set to the opposite role, but can be set to OOS.
- Each configured and active WAN port can be used for NSE Management activity, and the WMI is available on that address.
- Multiple WAN interfaces may be configured and used for management activity (but not subscriber traffic), even without the Load Balancing license feature (or with the feature disabled).
- Out of the box, the NSE will boot with one WAN port and one LAN port enabled, and the remaining ports set to out-of-service.

To view and configure WAN interfaces, select **Configuration**>**Ethernet Ports/WAN**. The Current Interfaces Settings screen appears, which summarizes all WAN connections.



Ethernet Ports & WAN Interface Configuration and Status

Page loaded at: FRI AUG 2

Current Interface Settings

Name / Label	*Role	Cfg Mode	IP Address	Mask	Gateway	Link	Inet Access	Up / Down Link Speed (Kbps)
WAN	WAN	Static	192.168.1.4	255.255.255.0	192.168.1.1	Up	Unavailable	50000 / 50000
Eth1	SUB	n/a	n/a	n/a	n/a	Down	n/a	n/a
Eth2	SUB	n/a	n/a	n/a	n/a	Down	n/a	n/a
Eth3	OOS	n/a	n/a	n/a	n/a	Down	n/a	n/a
Eth4	SUB	n/a	n/a	n/a	n/a	Down	n/a	n/a
Eth5	OOS	n/a	n/a	n/a	n/a	Down	n/a	n/a

Show Summary

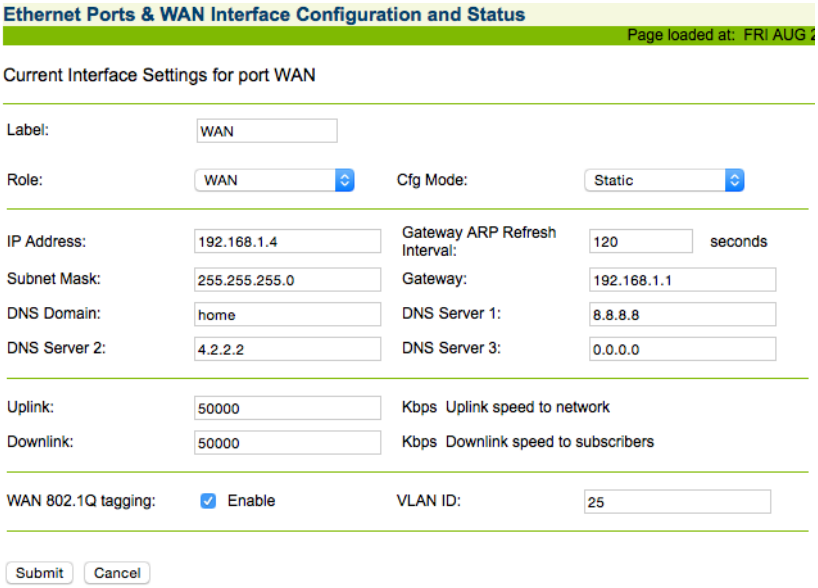
Legend:

n/a	***Non-applicable***. Values are unnecessary for the chosen ***Role***.
Unknown	***Inet Access*** is ***Unknown*** if Port's ***Link*** is ***Up*** and ***Interface Monitoring*** is disabled.

*Role Configuration:

WAN	Wide Area Network
SUB	Subscriber Network
OOS	Out-of-Service

Click any individual interface name to view and set details of the individual WAN.



Setting the Home Page Redirection Options {Home Page Redirect}

This procedure shows you how to redirect the subscriber's browser to a specified home page. Subscribers may also be redirected to a page specified by the solution provider, without any interaction with the authentication process.

You must configure DNS if you want to enter meaningful URLs instead of numeric IP addresses into any of the Access Gateway's configuration screens.

1. From the Web Management Interface, click on **Configuration**, then **Home Page Redirect**. The *Home Page Redirection Settings* screen appears:

2. Click on the check box for **Home Page Redirection** to enable this feature. If you enable home page redirection, you must provide a URL for the redirected home page.
3. Enter the URL of the redirected home page in the **Home Page URL** field.
4. If required, click on the check box for **Parameter Passing**.

   Parameter passing allows the Access Gateway to track a subscriber's initial Web request (usually their home page) and pass the information on to the solution provider. The solution provider uses this information to ensure that the subscriber can return to their home page easily.
5. In the **Redirection Frequency** field, specify the frequency (in minutes) for home page redirection. This is the interval at which the subscriber is redirected to the solution provider's home page automatically.
6. Click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset all the values to their previous state.

Enabling Intelligent Address Translation (iNAT™)

The Nomadix patented iNAT™ feature contains an advanced, real-time translation engine that analyzes all data packets being communicated between the private and public address domains. The Nomadix iNAT™ engine performs a defined mode of network address translation based on packet type and protocol (for example, IKE etc…).

NSE provides the following iNAT enhancements:

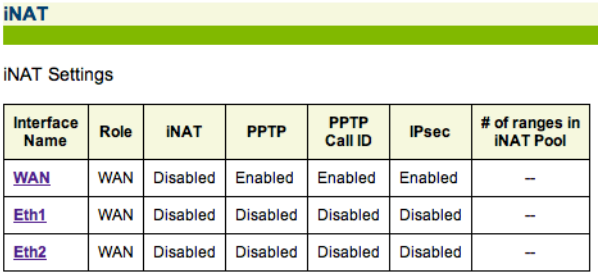
- A separate iNAT interface page shows the settings for each port in either WAN or OOS modes. Ports in SUB mode are not shown.

- Each of the displayed ports has individual iNAT / Subscriber tunnel settings accessible by clicking on that port's link.
- The interface allows easy deletion of any iNAT address range.

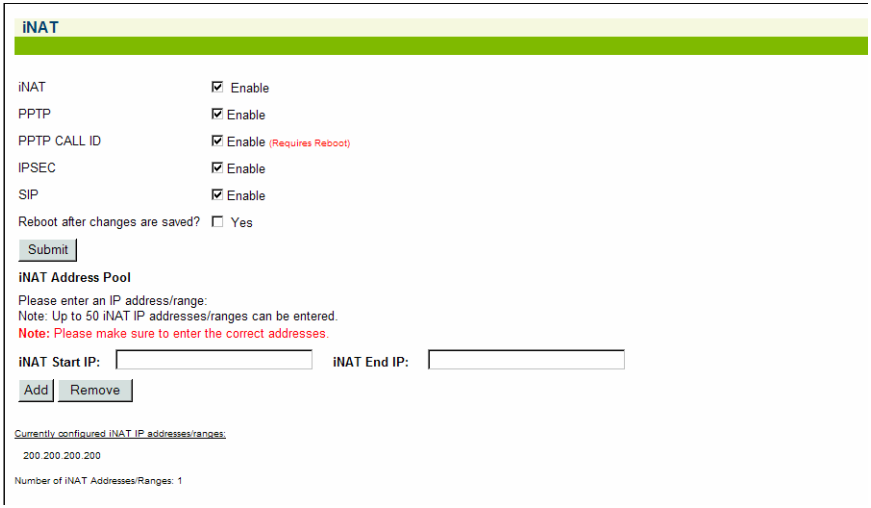
iNAT settings are configured individually for each interface.

1. From the Web Management Interface, click on **Configuration**, then **iNAT**.

   A list of current iNAT settings appears. You can select a specific interface to change its iNAT configuration.



   The *iNAT*™ screen appears:



2. Enable or disable the iNAT feature, as required.
3. If you enabled iNAT, you have the option of enabling or disabling the following VPN protocols:
   - PPTP

- PPTP CALL ID
- IPSEC

4. Click on the **Submit** button to save your options.

   Use the **iNAT Start** and **iNAT End** fields to enter an IP address or range of IP addresses (up to 50), then click on the **Add** button to add the IP address(es), or click on the **Remove** button to delete the IP address(es) from the database.

Defining IPSec Tunnel Settings {IPSec}

1. From the Web Management Interface, click on **Configuration**, then **IPSec**. The *IPSec Tunnel Settings* screen appears:

IPSec Tunnel Settings
Global Settings
Enable IPSec
Enable NAT Traversal
Submit
Reset
IPSec Tunnel Peers (up to 10 may be created)
Peer IP Address
Authentication Method
78.90.2.5
Pre-shared key
Add
Click here to add a new IPSec Tunnel Peer
IPSec Security Policies (up to 30 may be created)
SP# Peer IP Address Protocol Remote IP/Subnet:port Local IP/Subnet:port Type
1 78.90.2.5 ANY 10.1.0.0/16 10.149.65.0/24 ESP
2 78.90.2.5 ANY 10.1.0.0/16 67.130.149.65* ESP
* Local IP Address is derived from the current Network IP Address
Add
Click here to add a new IPSec Security Policy.

2. Check the **Enable IPsec** checkbox to enable IP Security. Note that you will have to reboot for IPsec to take effect.
3. Check **Enable NAT Traversal** to allow packets to traverse NAT/IPsec boundaries.

4. Click **Submit** to save the setting.

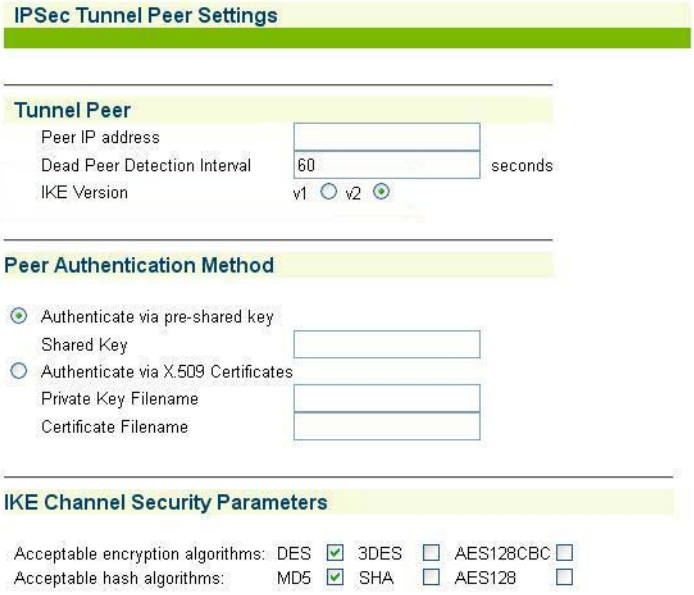
   To add or modify IPsec tunnel peers, see "Managing IPSec Tunnel Peers" on page 122. To add or modify IPsec security policies, see "Managing IPSec Security Policies" on page 123.

Managing IPSec Tunnel Peers

You can add a new IPSec tunnel peer or modify the settings of an existing IPSec tunnel peer from the *IPSec Tunnel Settings* screen.

Adding a new IPSec tunnel peer

1. Click the **Add** button in the **IPSec Tunnel Peers** table. The *IPSec Tunnel Peer Settings* screen opens.



2. Enter the IP address of the peer in the **Tunnel Peer** field.
3. Enter a Dead Peer Detection interval (integer value in seconds).
4. Select the Internet Key Exchange (IKE) Protocol Version.
5. In the **Peer Authentication Method** section, select one of the two peer authentication methods:
   - **Authenticate via pre-shared key** – Enter the pre-shared key in the **Shared Key** field.

- **Authenticate via X.509 Certificate** –
  - Enter the filename of the private certificate in the **Private Key Filename** field.
  - Enter the filename of the public certificate in the **Certificate Filename** field.

Note that the files must exist on flash first.

6. In the **IKE Channel Security Parameters** section, select the following settings:
   - **Acceptable Encryption Algorithm**s – Check the **DES**, **3DES,** and/or **AES128CBC** checkboxes (you must check at least one option).
   - **Acceptable Hash Algorithm** – Check the **MD5**, **SHA**, and/or **AES128** checkboxes (you must check at least one option).
7. Click **Add** to add the IPSec tunnel peer to the **IPSec Tunnel Peers** table on the *IPSec Tunnel Settings* screen.
8. Click the **Back to Main IPSec Tunneling Settings page** link to return to the *IPSec Tunnel Settings* screen.

Modifying an Existing IPSec Tunnel Peer

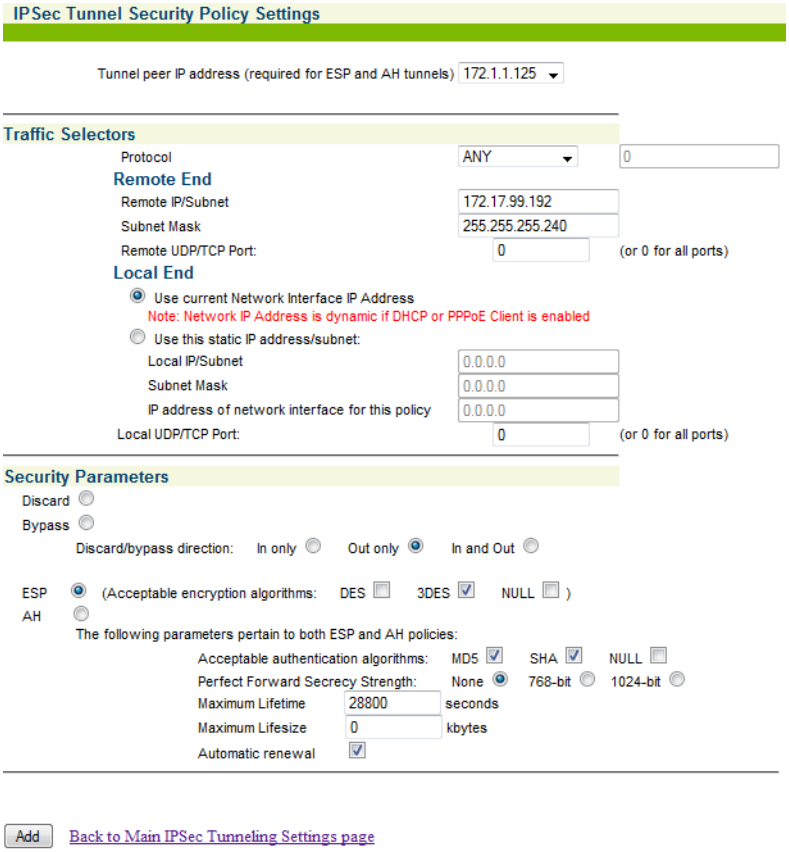
1. Click on the IPSec tunnel peer link that you wish to modify in the **IPSec Tunnel Peers** table. The *IPSec Tunnel Peer Settings* screen opens.
2. Modify the settings as desired.
3. Click:
   - **Modify** to save the changes to the peer.
   - **Remove** to remove the peer from the **IPSec Tunnel Peers** table.
   - **Reset** to undo any changes you made to the peer settings and return the peer to its original settings.
4. Click the **Back to Main IPSec Tunneling Settings page** link to return to the *IPSec Tunnel Settings* screen.

Managing IPSec Security Policies

You can add a new IPSec security policy or modify the settings of an existing IPSec security policy from the *IPSec Tunnel Settings* screen.

Adding a New IPSec Security Policy

1. In the **IPSec Security Policies** table, click the **Add** button to add an entry. The *IPsec Tunnel Security Policy Settings* screen opens.


IPSec Tunnel Security Policy Settings
Tunnel peer IP address (required for ESP and AH tunnels) 172.1.1.125
Traffic Selectors
Protocol ANY 0
Remote End
Remote IP/Subnet 172.17.99.192
Subnet Mask 255.255.255.240
Remote UDP/TCP Port: 0 (or 0 for all ports)
Local End
Use current Network Interface IP Address
Note: Network IP Address is dynamic if DHCP or PPPoE Client is enabled
Use this static IP address/subnet:
Local IP/Subnet 0.0.0.0
Subnet Mask 0.0.0.0
IP address of network interface for this policy 0.0.0.0
Local UDP/TCP Port: 0 (or 0 for all ports)
Security Parameters
Discard
Bypass
Discard/bypass direction: In only Out only In and Out
ESP (Acceptable encryption algorithms: DES 3DES NULL)
AH
The following parameters pertain to both ESP and AH policies:
Acceptable authentication algorithms: MD5 SHA NULL
Perfect Forward Secrecy Strength: None 768-bit 1024-bit
Maximum Lifetime 28800 seconds
Maximum Lifesize 0 kbytes
Automatic renewal
Add
Back to Main IPSec Tunneling Settings page

2. Select the tunnel peer IP address for which you would like to add a security policy from the **Tunnel peer IP address** menu. You must select a peer if the policy is using **ESP** or **AH**; if the policy is a **Discard** or **Bypass** policy, select **none**.
3. In the **Traffic Selectors** section, define a specific protocol by one of the following methods:
   - Select a specific protocol from the **Protocol** menu.
   - Enter a specific protocol number in the **Protocol** field. Protocol numbers are available at **www.iana.org/assignments/protocol-numbers**.

Next you will define selectors of the Security Policy. All selectors must match for the policy to be applied.

4. Define the following selectors for the **Remote End**:
   - **Remote IP/Subnet** – Enter the IP address of the remote network secured by the IPSec tunnel. The address can specify a host.
   - **Subnet Mask** – Enter the subnet mask of the remote network secured by the IPSec tunnel.
   - **Remote UDP/TCP Port** – Enter the port number; **0** is for all ports (only if protocol is UDP or TCP).
5. Security Policy can derive the settings for the Local End from the current Network IP settings of the unit. Select one of the following network options for the **Local End**:
   - **Use current Network Interface IP Address** – Select this option if you would like to use the current network interface IP Address. Note that the network IP address is dynamic if DHCP or PPPoE client is enabled. This setting is the default setting.
   - **Use this static IP address/subnet** – If you select this option you must also enter the **Local IP/Subnet**, the **Subnet Mask**, and the **IP address of network interface for this policy**.
     - The **Local IP/Subnet** is the IP address of the local network secured by the IPSec tunnel. The address can specify a host.
     - The **Subnet Mask** is the subnet mask of the local network secured by the IPSec tunnel. The address can specify a host.
     - The **IP address of network interface for this policy** is the IP Address for the NSE inside an IPSec tunnel. The IP address must be within the Local LAN subnet or the same as the Local LAN IP address. IP address 0.0.0.0 disables the functionality. The default setting is 0.0.0.0.
6. Enter the port number in the **Local UDP/TCP Port** field; **0** is for all ports (only if protocol is UDP or TCP).
7. In the **Security Parameters** section, define the parameters of the security policy. The options are **Discard**, **Bypass**, **ESP**, and **AH**. **ESP** is the default setting.
   - **Discard**
   - **Bypass** – Select the direction of the discard/bypass; the options are: **In only**, **Out only**, or **In and Out**. **Out only** is the default setting.
   - **ESP** – Select all the acceptable encryption algorithms by putting a check in the checkbox of each option; the options are: **DES**, **3DES**, and **NULL**. **3DES** is the default setting. See "**Setting joint ESP and AH parameters**" on page 126 to set parameters that pertain to both ESP and AH polices.

- **AH** – See "**Setting joint ESP and AH parameters**" on page 126 to set parameters that pertain to both ESP and AH policies.

Setting joint ESP and AH parameters

These parameters affect both ESP and AH policies.

- Select all the **Acceptable authentication algorithms** by putting a check in the checkbox of each option; the options are: **MD5**, **SHA**, and **NULL**. The default settings are **MD5** and **SHA**.
- Select the **Perfect Forward Secrecy Strength** to enable PFS. PFS makes the keying material used in protecting the data independent of the keying material used for protecting the IKE exchanges. The options are **None**, **768-bit**, and **1024-bit**. The default setting is **None**.
- Enter the maximum lifetime (in seconds) in the **Maximum Lifetime** field. The default settings **28800**.
- Enter the maximum life size (in kbytes) in the **Maximum Lifesize** field.
- Enable the automatic renewal option by putting a check in the **Automatic renewal** checkbox. The default setting is enabled.

8. Click **Add** to add the policy to the **IPSec Security Policy** table on the *IPSec Tunnel Settings* screen.
9. Click the **Back to Main IPSec Tunneling Settings page** link to return to the *IPSec Tunnel Settings* screen.

Modifying an Existing IPSec Security Policy

1. Click on the IPSec security policy link that you wish to modify in the **IPSec Security Policies** table. The *IPsec Tunnel Security Policy Settings* screen opens.
2. Modify the settings as desired.
3. Click:
   - **Modify** to save the changes to the policy.
   - **Remove** to remove the security policy from the **IPSec Security Policies** table.
   - **Reset** to undo any changes you made to the policy settings and return the policy to its original settings.
4. Click the **Back to Main IPSec Tunneling Settings page** link to return to the *IPSec Tunnel Settings* screen.

Load Balancing

Load Balancing is an optional licensed feature. For an overview of Nomadixload balancing and common use cases, see "Load Balancing and Link Failover" on page 33.

The NSE can balance subscriber assignment between all active WAN interfaces when Load Balancing mode is enabled. Note that subscribers are balanced, not traffic.

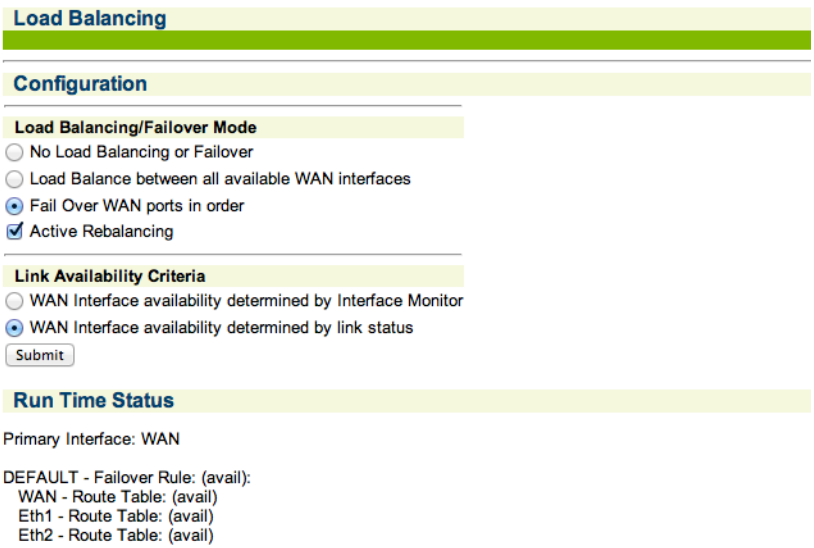
As subscribers go valid, they are assigned to a WAN interface, taking account of both the Uplink bandwidth settings of the interfaces and the number of subscribers currently using each interface. Higher bandwidth settings will mean more subscribers will be assigned to that interface. The subscriber will use the assigned interface for all traffic.

If a WAN interface goes down, the subscribers currently assigned to that interface will be re-assigned to the remaining interfaces. Once that interface is restored, current subscribers will NOT be re-assigned, but new subscribers can be assigned to that interface (in accordance with the load balancing algorithm).

An NSE reboot will rebalance all subscribers.

Subscribers will use the IP address of their WAN port (or assigned additional NAT address) for their DAT sessions.

To configure load balancing, choose **Configuration**>**Load Balancing**.


Load Balancing
Configuration
Load Balancing/Failover Mode
No Load Balancing or Failover
Load Balance between all available WAN interfaces
Fail Over WAN ports in order
Active Rebalancing
Link Availability Criteria
WAN Interface availability determined by Interface Monitor
WAN Interface availability determined by link status
Submit
Run Time Status
Primary Interface: WAN
DEFAULT - Failover Rule: (avail):
WAN - Route Table: (avail)
Eth1 - Route Table: (avail)
Eth2 - Route Table: (avail)

You can choose to trigger the Load Balancing / Failover feature either by the link status of the port(s) or by the active Interface Monitoring feature.

When either Interface Monitoring or link status is used, WAN ports will be characterized as either Available or Unavailable. If Load Balancing is configured to use Interface Monitoring but Monitoring itself is not configured, the status will be Unknown.

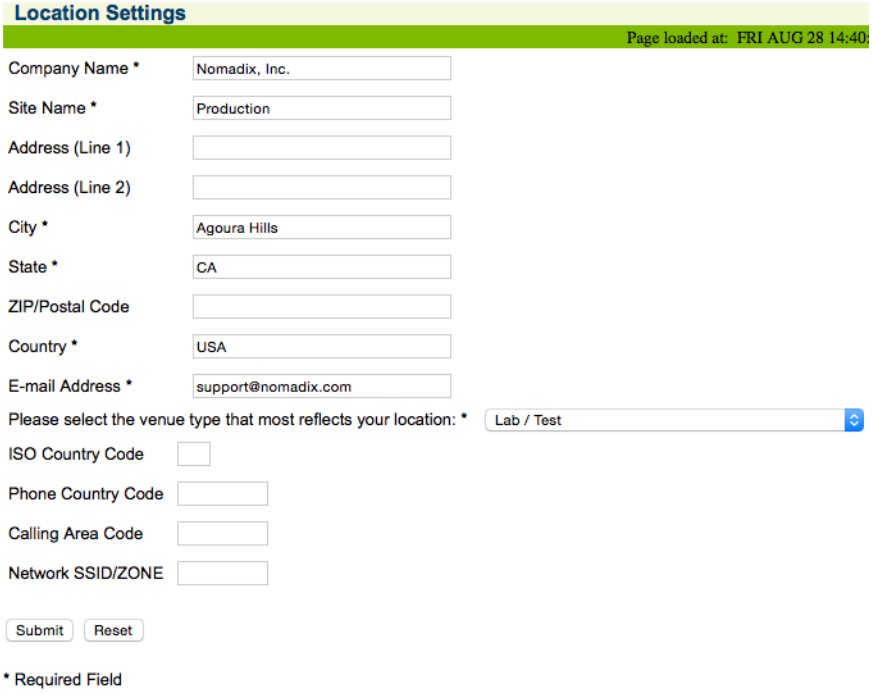
Using Link state will provide a faster response, but using Interface Monitoring will assure that there is internet access through that port before assigning subscribers to it.

Run Time Status gives a useful summary of all Load Balancing settings and subscriber distribution.

Establishing Your Location {Location}

This command sets up your location and the corresponding IP addresses for the network interface, subscriber interface, subnet, and default gateway. You *must* provide your full location information.

1. From the Web Management Interface, click on **Configuration**, then **Location**. The *Location Settings* screen appears:



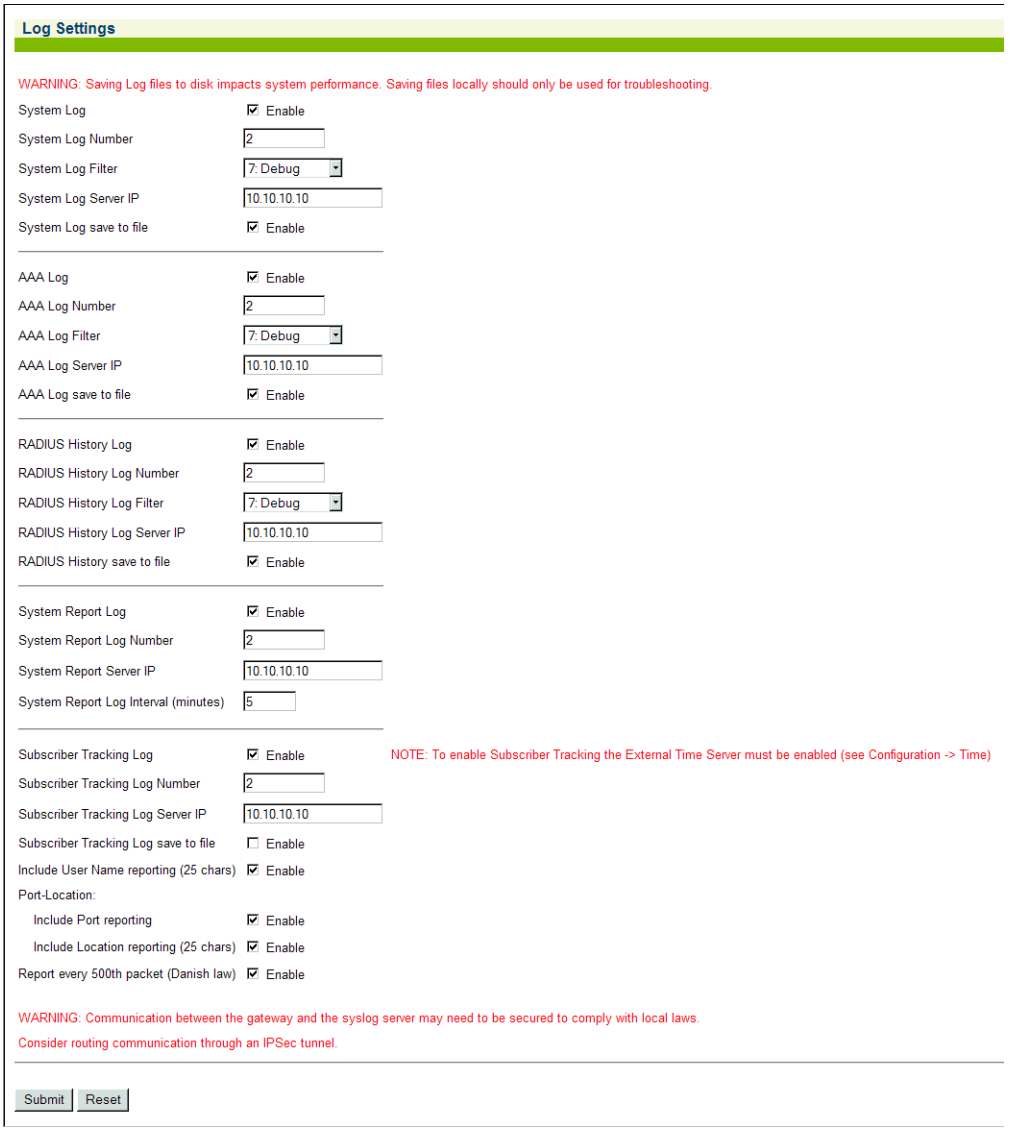
2. Enter your location information in the following fields:
   - Company Name
   - Site Name
   - Address (Line 1 and Line 2)
   - City, State, Zip, and Country
   - E-mail Address
   - ISO Country Code
   - Phone Country Code
   - Calling Area Code
3. Select the area type that most resembles your location from the drop down list.
4. Enter a **Network SSID/Zone**.
5. Click on the **Submit** button to save your changes and reboot the system, or click on the **Reset** button if you want to reset all the values to their previous state.

Managing the Log Options {Logging}

System logging creates log files and error messages generated at the system level. AAA logging creates activity log files for the AAA (Authorization, Authentication, and Accounting) functions. You can enable either of these options.

Although the AAA and billing logs can go to the same server, we recommend that they have their own unique server ID number assigned (between 0 and 7). When managing multiple properties, the properties are identified in the log files by their IP addresses.

1. From the Web Management Interface, click on **Configuration**, then **Logging**. The *Log Settings* screen appears:



2. If required, click on the check box for **System Log** to enable system logging.

   When system logging is enabled, the standard SYSLOG protocol (UDP) is used to send all message logs generated by the Access Gateway to the specified SYSLOG server.

3. Enter a unique number (between 0 and 7) in the **System Log Number** field. This ID number is assigned to the *System Log Server.*

4. Enter a valid IP address in the **System Log Server IP** field.

5. If required, repeat Steps 2 through 4 for the *AAA Log* feature.

6. **Setting a Log Filter**: The syslogs can be filtered at 7 levels as shown above. Setting the level to a number disables any syslogs above that filter setting. For e.g. setting the filter to 2:Critical only generates 0:Emergency, 1:Alert and 2:Critical level syslogs. All other syslogs are not generated.

7. **Log save to file Setting**: This setting enables/disables saving of syslogs generated by the system to a file named “syslog.txt” in the /flash directory of the NSE. This setting abides by the other settings set for the syslogs like filters, number and enable/disable.

   It is not required to input a server IP address if you intend to only store the syslogs locally. Please leave the IP address field blank for such cases.

   The following Logs are available for configuration on the NSE:

   ### AAA Log

   These logs record events related to Authentication, Authorization, and Accounting on the NSE.

   ### RADIUS History Log

   These logs record RADIUS proxy accounting messages sent or received by the RADIUS proxy. Please refer to “Viewing RADIUS Proxy Accounting Logs {RADIUS Session History}” on page 216 for additional configuration information.

   ### System Logs

   These logs record events specific to the NSE system itself.

   ### System Report Log

   These are Periodic Syslogs that report the status of the NSE and carry information about the NSE ID, NSE IP Address and the current number of Subscribers on the NSE.

   Example:

   INFO [nse_product_name version] SYSRPT: ID: 012345 IP: 11.222.333.444 (unresolved) Subscribers: 010

   Additional Configuration:

   ### System Report Log Interval

   This is the time interval in minutes between the system report syslogs.

Subscriber Tracking Log

Enabling this checkbox enables the Subscriber Tracking log. Use this to track the network usage of specific Subscribers on the network by receiving a syslog of every Session that is opened by each subscriber. Each new DAT session that is created for subscribers is logged in these syslogs. Proxy state, type of access, and Username are included besides the source and destination information of each session. There are IN and OUT messages for the beginning and ending of each session.

Examples:

INFO [Access Gateway v2.4.113] LI : IN-->: THU JUN 23 11:43:58 2007 | testlab | S(192.168.2.4/3444), D(66.163.175.128/80), X(67.130.149.4/5004), non-proxy , 00:90:27:78:81:00, RADIUS, IPASS/0U0000

INFO [Access Gateway v2.4.113] LI : OUT-->: THU JUN 23 11:44:01 2007 | testlab | S(192.168.2.4/3444), D(66.163.175.128/80), X(67.130.149.4/5004), non-proxy , 00:90:27:78:81:00, RADIUS, IPASS/0U0000

Field formats explained:

LI : IN-->: Day Month Date Time Year | NSE_Site_Name | S(Source_IP/Port), D(Destination_IP/Port), X(NSE_Translated_IP/Port), proxy_type , Subscriber_MAC, Billing_Type, UserName(first 12 char). LI : IN-->: THU JUN 23 11:43:58 2007 | testlab | S(192.168.2.4/3444), D(66.163.175.128/80), (67.130.149.4/5004), non-proxy , 00:90:27:78:81:00, RADIUS, IPASS/0U0000

Do not configure the Server IP as the Network side IP of the gateway Stored syslogs are viewable under System/Syslog menu. A total of 500 syslogs are stored locally.

Syslog History

```
Syslog History:

|-------------------------------------------------------------------------------|
| No.: Timestamp               | Version              | IP                      |
| Syslog...                                                                     |
|-------------------------------------------------------------------------------|
|-------------------------------------------------------------------------------|
| 001: THU JUN 03 12:15:39 2010|AG 5500 v7.0.030      | 67.130.149.163          |
| <134> INFO CFS: file: /flash/AuthFile.dat synchronized from cache             |
|-------------------------------------------------------------------------------|
| 002: THU JUN 03 12:15:27 2010|AG 5500 v7.0.030      | 67.130.149.163          |
| <134> INFO CLISRD: Starting PMS on the serial port                            |
|-------------------------------------------------------------------------------|
| 003: THU JUN 03 12:15:18 2010|AG 5500 v7.0.030      | 67.130.149.163          |
| <134> INFO CTRL: GetAliveNotifyInFlash Error opening /flash/usgInfo.dat       |
|-------------------------------------------------------------------------------|
| 004: THU JUN 03 12:15:18 2010|AG 5500 v7.0.030      | 67.130.149.163          |
| <134> INFO CLITND: CLI Telnet Daemon: socketFd is 21, location ofvariable i|
| s 0xb9e6b8                                                                    |
|-------------------------------------------------------------------------------|
| 005: THU JUN 03 12:15:18 2010|AG 5500 v7.0.030      | 67.130.149.163          |
| <134> INFO CLISRD: 0206 Setting COM1 to 9600 baud                             |
|-------------------------------------------------------------------------------|
| 006: THU JUN 03 12:15:18 2010|AG 5500 v7.0.030      | 67.130.149.163          |
| <134> INFO Config: configGetRaw: configuration from /flash/nisacc.txt         |
|-------------------------------------------------------------------------------|
| 007: THU JUN 03 12:15:18 2010|AG 5500 v7.0.030      | 67.130.149.163          |
| <134> INFO INIT: AG 5500 v7.0.030 with ID 01633F Initialized                  |
|-------------------------------------------------------------------------------|
| 008: THU JUN 03 12:15:18 2010|AG 5500 v7.0.030      | 67.130.149.163          |
| <135> DEBUG iNAT: PROXYALGDATAs should be between 0x4980ffc and 0x4ff0ffc     |
|-------------------------------------------------------------------------------|
| 009: THU JUN 03 12:15:18 2010|AG 5500 v7.0.030      | 67.130.149.163          |
| <135> DEBUG iNAT: ndxSessionListNodes should be between 0x3092030 and 0x39a|
| b430                                                                          |
|-------------------------------------------------------------------------------|
| 010: THU JUN 03 12:15:18 2010|AG 5500 v7.0.030      | 67.130.149.163          |
| <134> INFO DHCP: ndxDHCPInit: 0021 DHCP initialized                           |
|-------------------------------------------------------------------------------|
| 011: THU JUN 03 12:15:18 2010|AG 5500 v7.0.030      | 67.130.149.163          |
| <131> ERROR Config: configGetRaw: Error opening /flash/ddns.txt               |
|-------------------------------------------------------------------------------|
| 012: THU JUN 03 12:15:18 2010|AG 5500 v7.0.030      | 67.130.149.163          |
| <131> ERROR INIT: SSL context initialization failed                           |
|-------------------------------------------------------------------------------|
| 013: THU JUN 03 12:15:18 2010|AG 5500 v7.0.030      | 67.130.149.163          |
| <131> ERROR SSL: Unable to set cert and key files for network context         |
|-------------------------------------------------------------------------------|
| 014: THU JUN 03 12:15:18 2010|AG 5500 v7.0.030      | 67.130.149.163          |
| <131> ERROR SSL: Unable to set cert file  code: 33558531|                      |
|                                                                               |
|-------------------------------------------------------------------------------|
```

PageFaults are stored in the file named "lograw.txt" in the /flash directory and is not viewable on the web management interface.

1. Check the **Subscriber Tracking Log** option to enable or disable the Subscriber tracking log. *Note: NTP must be enabled on the NSE for Subscriber tracking log to be enabled.*
2. Enter the subscriber tracking log number in the **Subscriber Tracking Log Number** field. This is the syslog number to identify this syslog to your Server.
3. Enter the IP address of the Syslog server that is listening for the syslogs from your NSE in the **Subscriber Tracking Log Server IP** field.

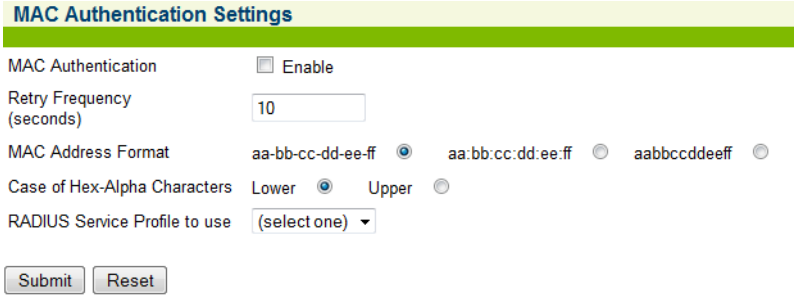
4. Check the **Subscriber Tracking Log save to file** option to save the syslogs locally to the NSE flash. *Note: Not recommended.*
5. Check the **Include User Name Reporting** option to include the first 25 characters of the username in the Syslog.
6. Check the **Port Location: Include Port Reporting** option and **Port Location: Include Location** option to include the port information from the port location table and the Port reported to the system by either VLAN or SNMP query. The Location information is limited to 25 characters.
7. Check the **Include every 500th Packet** option to follow the Danish law that requires the 500th packet for each subscriber to be logged. Enabling this will send the 500th packet for each subscriber to the syslog system.

Click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset all the values to their previous state.

When logging is enabled, log files and error messages are sent to these servers for future retrieval. To see sample reports, go to "Sample SYSLOG Report" on page 314 and "Sample AAA Log" on page 313.

Enabling MAC Authentication {MAC Authentication}

1. From the Web Management Interface, click on **Configuration**, then **MAC authentication**. The *MAC Authentication Settings* screen appears:



2. Check the **MAC Authentication** checkbox to enable the MAC-based authentication functionality. The default setting is disabled.
3. Enter the retry frequency (in seconds) in the **Retry Frequency** field. This setting is the wait time, in seconds, before reattempting MAC authentication following a failed attempt. The minimum (and default) value is 10 seconds.
4. Select the **MAC Address Format**. This setting is the format in which the subscriber's MAC address will be expressed in the RADIUS username and password attributes. The

RADIUS server must use the same format. The options are: **aa-bb-cc-dd-ee-ff**, **aa:bb:cc:dd:ee:ff**, or **aabbccddeeff**. The default setting is **aa-bb-cc-dd-ee-ff**.

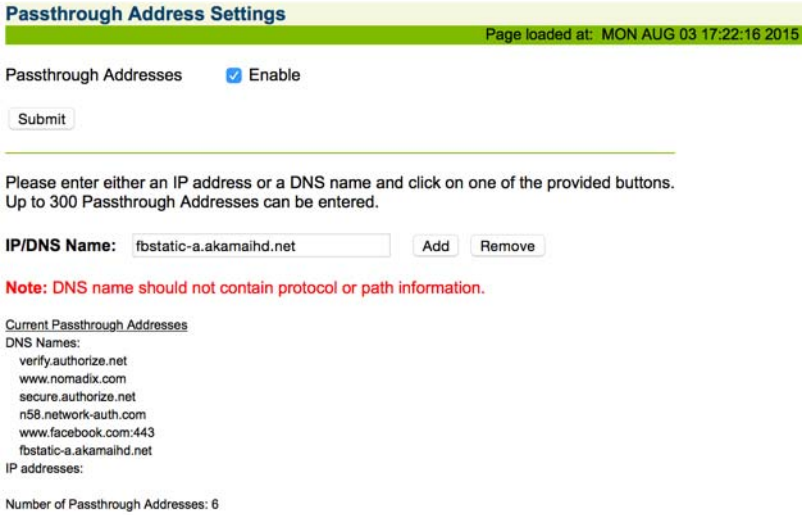
5. Select the **Case of Hex-Alpha Characters**. This setting specifies, in the MAC addresses in RADIUS username and password attributes, whether the hex-alpha characters A-F will be uppercase or lower case. The options are **Lower** or **Upper**. The default setting is **Lower**.
6. Select the **RADIUS Service Profile to use** from the **RADIUS Service Profile to use** menu. This setting specifies the RADIUS Service Profile (and therefore, which RADIUS servers) to use for MAC-based Authentication purposes.
7. Click **Submit** to save the settings or **Reset** to return the settings to the previous state.

Assigning Passthrough Addresses {Passthrough Addresses}

The Access Gateway allows up to 300 IP passthrough addresses and DNS names. This feature allows users to "pass through" the Access Gateway and access predetermined services (for example, the redirected home page) at the solution provider's discretion, even though they may not have subscribed to the broadband Internet service. This is useful if solution providers want to openly promote selected services to all users, even if they are not currently subscribing (paying) for access. Allowing up to 300 passthroughs (IP and DNS) offers customers greater promotional flexibility.

The Access Gateway is supplied with "Hotmail®" as a default passthrough setting.

1. From the Web Management Interface, click on **Configuration**, then **Passthrough Addresses**. The *Passthrough Address Settings* screen appears:



2. If required, enable **Passthrough Addresses**, then click on the **Submit** button.

   If you are supporting Facebook athentication, you must add Passthrough Addresses www.facebook.com:443 and fbstatic-a.akamaihd.net.

3. In the **IP/DNS Name** field, enter the IP address or DNS name of the pass-through you want to add or remove from the system.

   The system only accepts route DNS names (for example, www.nomadix.com). Do not include protocol, port, or path information.

4. If adding this pass-through, click on the **Add** button, otherwise click on **Remove** to delete this pass-through from the list.

Assigning a PMS Service {PMS}

Your product license may not support this feature.

The Access Gateway can be integrated with existing Property Management Systems. For example, by integrating with a hotel's PMS, the Access Gateway can post charges for Internet

access directly to a guest's hotel bill. In this case, the guest is billed only once. The Access Gateway outputs a call accounting record to the PMS system whenever a subscriber purchases Internet service and decides to post the charges to their room. The Access Gateway offers "post-paid" PMS billing functionality for all supported PMS interfaces, providing hotel guests with the option to terminate their connection (via the ICC) and be billed only for the actual time he/she was online. The Access Gateway is equipped with a serial port to facilitate connectivity with the system's CLI or a customer's Property Management System.

Some PMS vendors may require you to obtain a license before integrating the PMS with the Access Gateway. Check with the PMS vendor.

Some Property Management Systems may use interfaces that are incompatible with the Access Gateway. If your Access Gateway is having trouble communicating with a solution provider's PMS, please contact technical support. Refer to "Contact Information" on page 349.

Before you can change the PMS settings, a PMS must be connected to the Access Gateway via the serial port on the rear panel. See also, "Connecting the Access Gateway to the Customer's Network" on page 67.

The Access Gateway can query most popular Property Management Systems for confirmation of the "names" and "room numbers" of hotel guests—effectively becoming a "clone" of a popular Micros POS system. This functionality allows hotels to seamlessly deploy wireless networks (or alternatively use low-cost wired access concentration equipment) that either do not support port-ID or do so in a proprietary format that Nomadix does not currently support—and still be able to bill directly to the room.

Nomadix has certified interoperability with a variety of Property Management Systems:

- Encore
- FCS
- Galaxy (GEAC)
- GuestView
- Holodex (AutoClerk)
- Hilton 1
- Hilton 2
- Hotel Info Sys (HIS)
- Igets.net
- Innquest

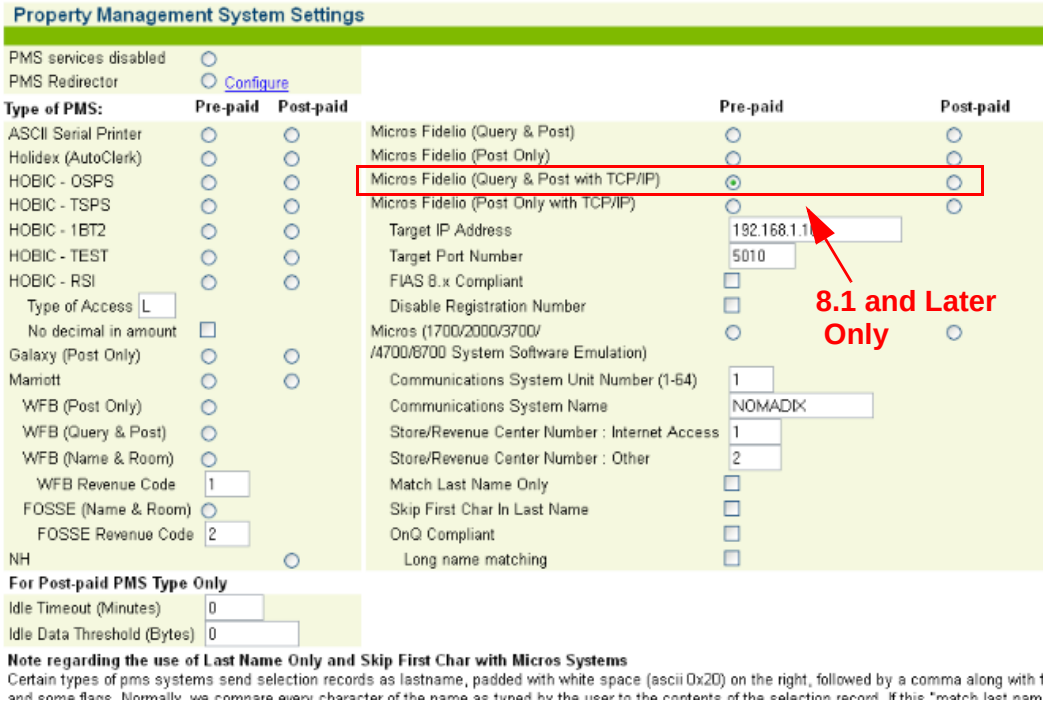
- LanMark
- LIBICA
- Logistics
- Maestro
- Marriott
- Megasys Hospitality Systems
- Micros Fidelio FIAS (Serial, TCP/IP and Query/Post interface)
- MSI
- NH Hotels
- Protocol Technologies
- Ramesys ImagInn PMS
- OnQ (System 21)
- Xeta Virtual XL

For Micros Fidelio FIAS, Nomadix also supports a serial Redirector Service, which provides a means to send FIAS command messages through the NSE XML interface.

Nomadix offers the following standards-based interfaces, generally used to establish an interface to any of the PMS systems that are not proprietary:

- HOBIC-RSI
- HOBIC-TSPS
- HOBIC-1BT2
- HOBIC-TEST
- HOBIC-OSPS

1. From the Web Management Interface, click on **Configuration**, then **PMS**. The *Property Management System Settings* screen appears:



2. You have the option of disabling PMS services by clicking on the **PMS services disabled** radio button, then clicking on the **Submit** button to save your choice. If you disable PMS services you can exit this procedure, otherwise go to Step 4.

3. Select the **Type of PMS** (**Pre-paid** or **Post-paid**) you require from the available list, or choose the **ASCII Serial Printer** option (when a serial printer is connected to the Access Gateway's serial port)—you can choose only one of the listed options.

The pre-paid option requires hotel guests to "pre-pay" for services. The post-paid option allows hotel guests to terminate their connection (via the ICC) and be billed only for the actual time they are online. The NH proprietary PMS is offered on a "post-paid" basis only.

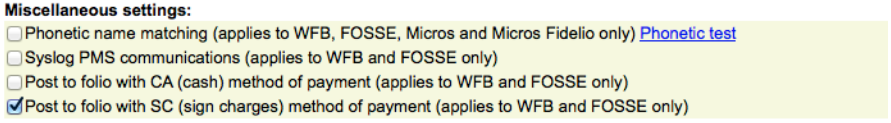
- If you choose HOBIC - RSI, you must select the Type of Access.
- For Marriott, you can either choose Marriott or you can choose a type of WFB interface (Post Only, Query and Post, or Name and Room).

- Click **Disable Registration Number** to suppress prompt for a registration number on guest login.
- If you choose Micros Fidelio (Post Only with TCP/IP), you must provide the Target IP Address and the Target Port Number.
- If you choose Micros (1700/2000/3700/4700/8700 emulation) you must provide the following additional information:
  - Communications System Unit Number (1 - 64)
  - Communications System Name
  - Store Revenue Center Number: Internet Access
  - Store Revenue Center Number: Other

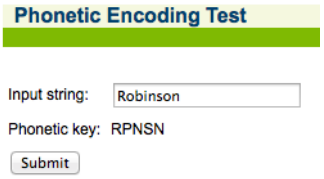
You also have the following check box options (see note):

- Match Last Name Only
- Skip First Char in Last Name
- OnQ Compliant (Enable this option if you want to use Nomadix Micros POS emulation to query & post to Hilton Corporation's OnQ PMS system).

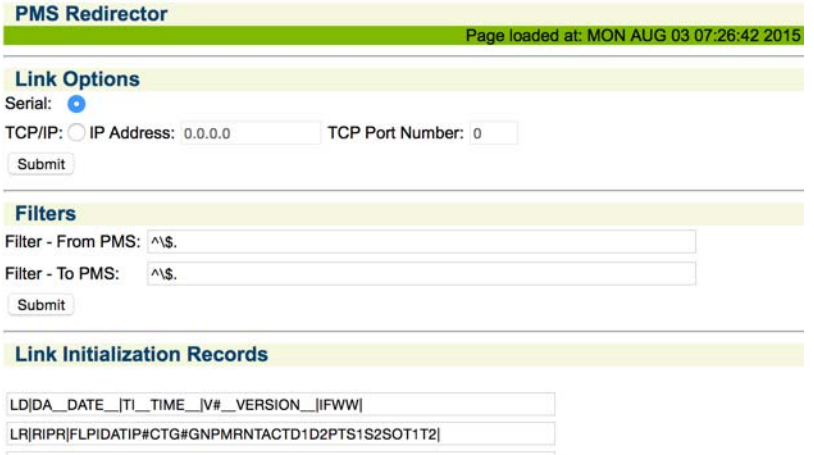
4. In the **Miscellaneous Settings** group, you may enable phonetic name matching for WFB, FOSSE, MICROS, and MICROS Fidelio. This feature uses Metaphone3 to perform phonetic name matching between data supplied by the subscriber and the data provided by the PMS.


Miscellaneous settings:
Phonetic name matching (applies to WFB, FOSSE, Micros and Micros Fidelio only) Phonetic test
Syslog PMS communications (applies to WFB and FOSSE only)
Post to folio with CA (cash) method of payment (applies to WFB and FOSSE only)
Post to folio with SC (sign charges) method of payment (applies to WFB and FOSSE only)

5. Click **Phonetic test** to test the feature. Enter a string; the NSE will return a phonetic key.



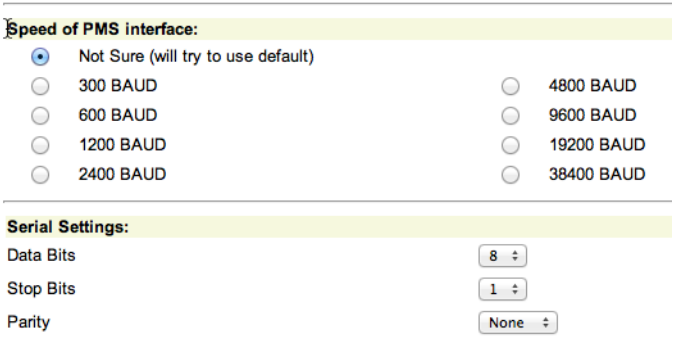
6. Click **Post to folio** with CA or SC to enable cash and signed charge payments (Marriott).
7. To view or modify PMS Redirector Service parameters, click the **Configure** link next to the PMS Redirector selector option. The PMS Redirector page appears:



8. *Post-paid PMS only:* If you selected a Post-paid PMS option, you can define an **Idle Timeout** (in minutes) and an **Idle Data Threshold** (in bytes). These selections determine the thresholds when a "post-paid" hotel guest will be automatically disconnected from the service.

   Property Management Systems generally operate at different baud rates. You must now select an appropriate baud rate for your chosen PMS.

9. Select the **Speed of PMS Interface** and Serial Settings from the available list. If you are not sure which baud rate to choose, select **Not Sure** and the system will attempt to use the default.

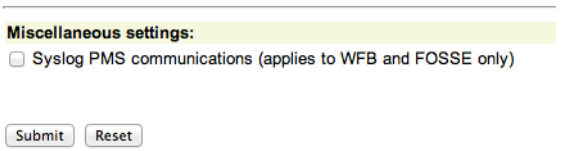


10. You must now select the **Type of Service Post Mappings** you require relative to the billing plans you established in "Defining the Billing Options {Billing Options}" on page 217.

Because some Property Management Systems do not allow you to enter characters, you must enter these service descriptions as a numeric value only (no characters or delimiters). The numbers must be entered in the form of a “telephone number” which the selected PMS will interpret.

If the “phone number” field required by the PMS is shorter than 15 characters, only the first required number of characters will be supplied.

11. If desired, enable Syslog PMS communications.



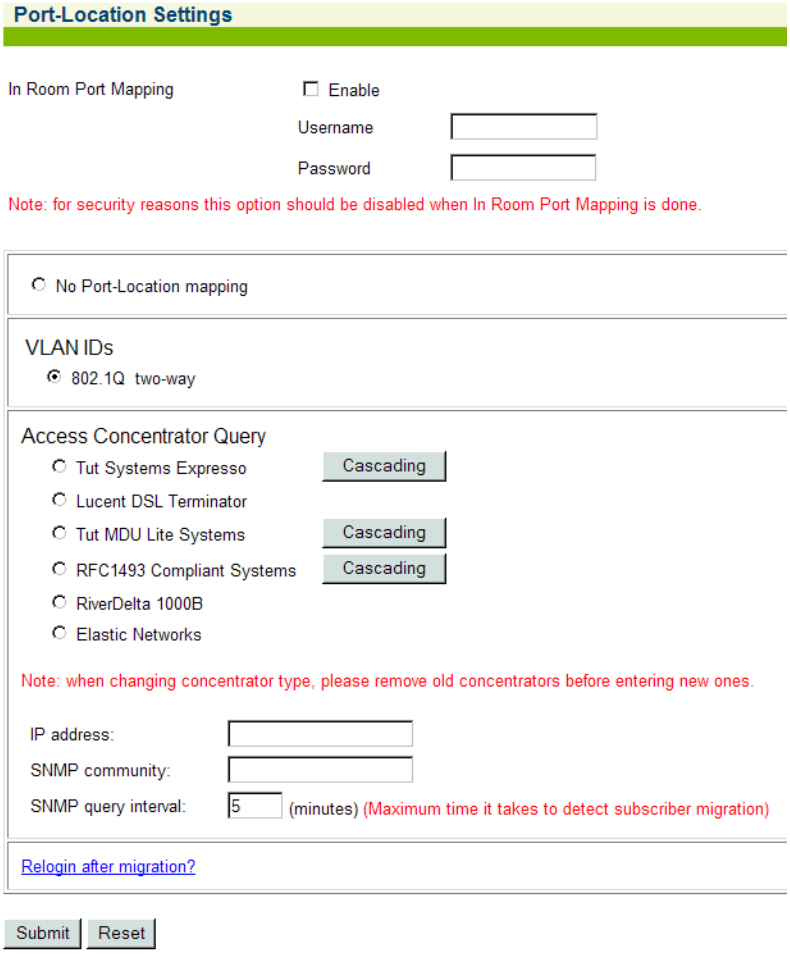
12. Click on the **Submit** button to save your changes and restart the serial interface, or click on the **Reset** button if you want to reset all the values to their previous state.

Based on the HOBIC interface standards, Nomadix, Inc. has also certified interoperability with a number of other PMS and call accounting solutions such as Ramesys’ ImagInn, Xeta Virtual XL, and Hilton’s proprietary standard OnQ. This development effort is on-going. For an up-to-date list of supported PMS systems, please contact our Technical Support team. Refer to “Technical Support” on page 349.

Setting Up Port Locations {Port-Location}

Port-Location allows you to establish the mode of operation for devices.

1. From the Web Management Interface, click on **Configuration**, then **Port-Location**. The *Port-Location Settings* screen appears:



2. System administrators can set the properties for each room from the subscriber side of the Access Gateway. The system automatically detects which port number the administrator is using and allows them to enter the fields for the room corresponding to the port they are using.

   If required, click on the check box for **In Room Port Mapping** to enable this feature.

3. If you enabled *In Room Port Mapping*, you must assign a **Username** and **Password**. You will need these when you perform port mapping from the subscriber side of the Access Gateway.

   Go to "In Room Port Mapping" on page 146 to map rooms from the subscriber side of the Access Gateway.

   For security reasons, this feature should be disabled when in room port mapping (from the subscriber side of the Access Gateway) is completed.

4. Select **No Port Location Mapping** if you are not using Port-based access.

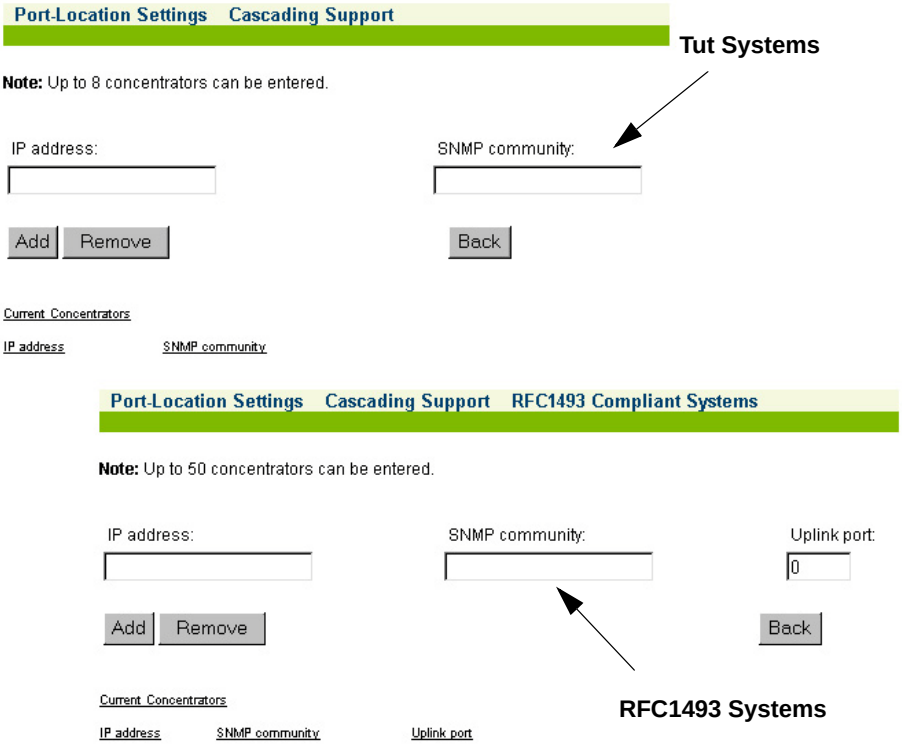
5. If you are using an access concentration device that cannot handle VLAN IDs, select one of the available *Access Concentrator Query* options:

   The devices in the following list must be assigned an IP address on the same subnet as the Access Gateway. You must remove "old" concentrator types before entering new ones.

   - Tut Systems Expresso
   - Lucent DSL Terminator
   - Tut MDU Lite Systems
   - RFC1493 Compliant Systems
   - RiverDelta 1000B
   - Elastic Networks

These options enable an SNMP query to “ask” the access concentration device which card, slot, or port the information is coming from. The information can then be “sent to” and “billed by” the PMS. You must enter the **IP address** (not name), **SNMP community**, and **SNMP query** duration (maximum time it takes to detect subscriber migration) of all access concentrators connected to the site. You can also opt to Relogin after migration by checking the “Relogin after migration” **Enable** box.

For “cascading” Tut and RFC1493 compliant systems, click on the associated **Cascading** button. The *Cascading Support* screen appears, allowing you to enter the IP address and SNMP community for the primary and all “cascading” devices connected to the site. For RFC1493 compliant systems, you have the additional option of defining the “Uplink port.”



From the *Cascading Support* screen, you can return to the main *Port-Location Settings* screen at any time by pressing the **Back** button.

6. Click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset all the values to their previous state.

See In Room Port Mapping.

In Room Port Mapping

This section shows In Room Port Mapping from the subscriber side, when the *In Room Port Mapping* feature is enabled.

Access Gateway multiple VLAN tagged systems can use the same tags and be placed on different Subscriber ports. Although it is technically possible to place two different VLAN tagged switches (one on each Subscriber side) that have the same VLAN tags designated, this configuration can cause problems. To avoid conflicts, you must ensure that the VLAN tags are different on the different devices.

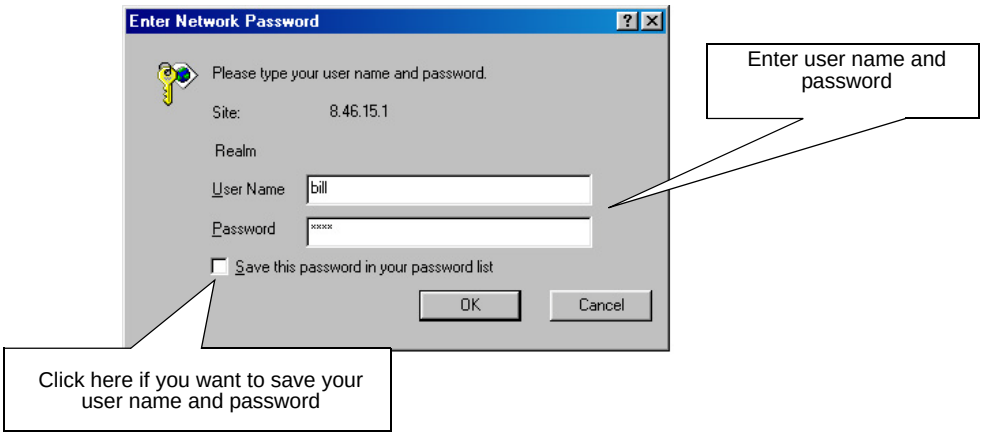
1. Enable **In Room Port Mapping** and assign a user name and password (see previous section, Steps 2 and 3).
2. Enter the following URL target format:

   http://(Access Gateway IP address):1111/usg/roommapping

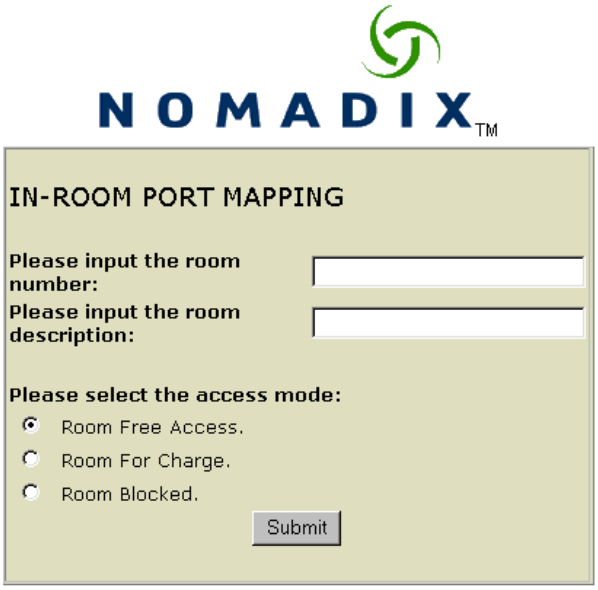
   For example:

   http://219.57.108.103:1111/usg/roommapping

   The *Enter Network Password* prompt appears:



3. Enter your user name and password, then click on the **OK** button. The *In Room Port Mapping* screen appears:



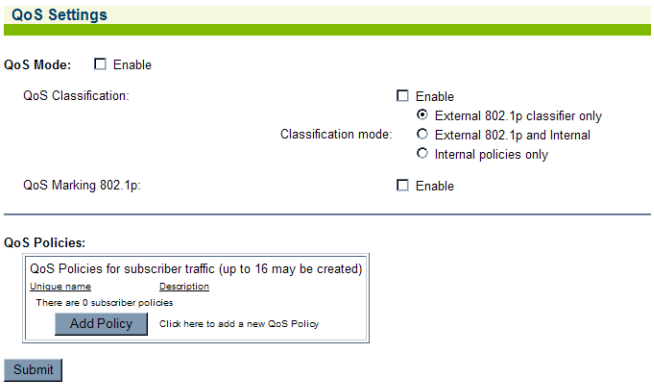
4. Enter the room number and a description for this room.
5. Select the access mode you want to assign to this room:
   - Room Free Access
   - Room For Charge
   - Room Blocked
6. Click on the **Submit** button to save your changes.
7. Repeat Steps 4 through 6 for each room (see note).

If you leave your browser open, the "cookie" that is placed on your system will allow you to go from room to room during the mapping process. However, if you close your browser, the cookie is deleted and you will need to login again.

Setting up Quality of Service {QoS}

The Quality of Service feature allows subscriber traffic to be classified so that it can then be acted upon by devices that support QoS prioritization or other QoS capabilities. This requires the use of 802.1q-based VLANS on the network, as it is based on 802.1p Class of Service (CoS) marking. The QoS classification function supports both external and internal modes. In External mode, when the NSE received packets with 802.1p priority bits already set, it will pass the priority values through unaltered. In Internal mode, classification and resultant bit marking is performed via QoS policies that are defined within the NSE. The two modes can also be used in combination.

1. From the Web Management Interface, click on **Configuration**, then **QoS**. The *QoS Settings* screen appears:



2. Enable **QoS Mode** if you want to use QoS policies.
3. Enable **QoS Classification** to facilitate the classification mode desired. Classification can be based on internally defined policies, by incoming frames that are already classified, or both.
4. Enable **QoS Marking** to mark packets using 802.1p Class of Service values.

5. Select **Add Policy** to define a new QoS policy, or select a link to a policy that is already defined in order to modify it.The *Add QoS Policy for Subscribers* screen appears:

Add QoS Policy for Subscribers
Name of QoS Policy: test (max. 16 chars)
Description: new policy (max. 128 chars)
Apply the following rules to subscriber's traffic (up to 16 rules can be applied):
Traffic descriptor
802.1p Class-of-Service
Rule 1
bnet
CoS 3
There is 1 rule in this policy
Default CoS for all other traffic: CoS 1
Submit Policy
Add new rule:
Select Traffic Descriptor:
Select Class-of-Service:
descriptor1
CoS 5
Add Rule
Back to Main QoS Settings page

6. Enter a name for the policy in the **QoS Policy** field.
7. Enter a brief summary about the policy **Description** field. The rule list displays a list of the rules that have been defined for this policy.
8. Click **Submit Policy** to accept the parameters and rules defined and add the policy to the policy list on the main page.
9. Select a traffic descriptor and a Class of Service for the rule, and then click **Add Rule**. Once added, rules will be displayed in the list above.

Defining the RADIUS Client Settings {RADIUS Client}

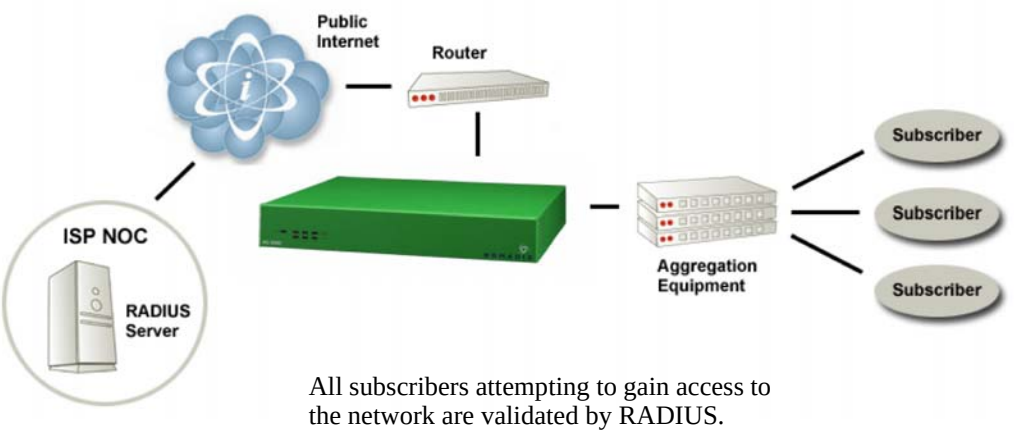
The Access Gateway supports Remote Authentication Dial-In User Service (RADIUS). RADIUS is an authentication and accounting system used by many Internet Service Providers.

The "Usernames" function must be enabled for a RADIUS login. See also, "Configuration Menu" on page 80.

Nomadix offers an integrated RADIUS client, allowing service providers to track or bill users based on the number of connections, location of the connection, bytes sent and received, connect time, etc. The customer database can exist in a central RADIUS server, along with associated attributes for each user. When a customer connects into the network, the RADIUS

client authenticates the customer with the RADIUS server, applies associated attributes stored in that customer's profile, and logs their activity (including bytes transferred, connect time, etc.).

The Access Gateway's RADIUS implementation also handles vendor specific attributes (VSAs), required by WISPs that want to enable more advanced services and billing schemes, such as a per device/per month connectivity fee.

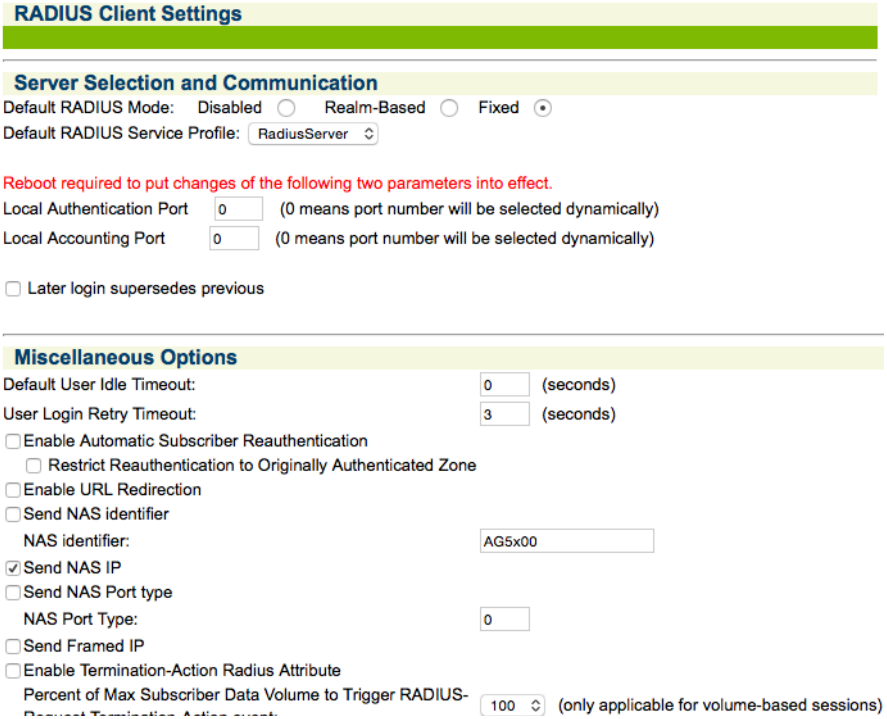


All subscribers attempting to gain access to the network are validated by RADIUS.

For additional RADIUS information, see also:

- "Defining the RADIUS Proxy Settings {RADIUS Proxy}" on page 154
- "Defining the Realm-Based Routing Settings {Realm-Based Routing}" on page 158
- "RADIUS Attributes" on page 317

1. From the Web Management Interface, click on **Configuration**, then **RADIUS Client**. The *RADIUS Client Settings* screen appears:


RADIUS Client Settings
Server Selection and Communication
Default RADIUS Mode: Disabled Realm-Based Fixed
Default RADIUS Service Profile: RadiusServer
Reboot required to put changes of the following two parameters into effect.
Local Authentication Port 0 (0 means port number will be selected dynamically)
Local Accounting Port 0 (0 means port number will be selected dynamically)
Later login supersedes previous
Miscellaneous Options
Default User Idle Timeout: 0 (seconds)
User Login Retry Timeout: 3 (seconds)
Enable Automatic Subscriber Reauthentication
Restrict Reauthentication to Originally Authenticated Zone
Enable URL Redirection
Send NAS identifier
NAS identifier: AG5x00
Send NAS IP
Send NAS Port type
NAS Port Type: 0
Send Framed IP
Enable Termination-Action Radius Attribute
Percent of Max Subscriber Data Volume to Trigger RADIUS-
100 (only applicable for volume-based sessions)

2. Under the *Server Selection and Communication* options, choose the **Default RADIUS Mode**:
   - **Disabled** (to disable RADIUS authentication)
   - **Realm-Based** (for Realm routing)
   - **Fixed** (for routing to predefined RADIUS servers)
3. Select the **Default RADIUS Service Profile** from the pull-down menu.
4. Enter a **Local Authentication Port** and a **Local Accounting Port**.

5. Select whether **Later Login Supersedes Previous**. This will allow a secondary form of authentication to override MAC authentication if necessary, and use the credentials of the last login to succeed.

See Miscellaneous Options.

Miscellaneous Options

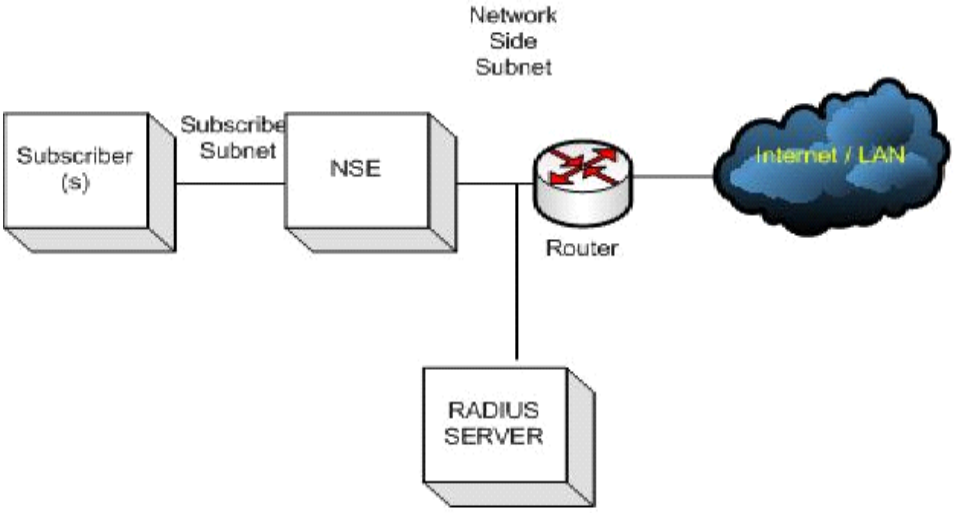
1. In the "Miscellaneous Options" category, Enter a value for the time (in seconds) in the **Default User Idle Timeout** field. This value determines how much "idle" time elapses before the subscriber's session times out and they must login again.
2. The Access Gateway can reauthenticate "repeat" subscribers who return to the system within 720 hours. To enable this feature, click on the check box for **Enable Automatic Subscriber Reauthentication**.
3. You can limit automatic reauthentication to the subscriber's original zone. To do this, check **Restrict Reauthentication to Originally Authenticated Zone.**
4. If you want to enable the URL redirection feature, click on the check box for **Enable URL Redirection**.
5. For a Network Access Server (NAS), if you want to send a NAS identifier with your account access request, click on the check box for **Send NAS identifier**, then define the NAS identifier in the **NAS identifier** field.
6. To send the NAS IP address with your account request, click on the check box for **Send NAS IP**.
7. To send a NAS port type with your account request, click on the check box for **Send NAS Port type**, then define the NAS port in the **NAS Port Type** field.
8. To send the Framed IP address with your account request, click on the check box for **Send Framed IP**.
9. To enable Radius termination action enhancement, click on the check box for **Enable Termination Action Radius Attribute**, then select the percentage (100% - 75%) of the maximum data volume threshold for which term-action will be enforced (volume-based sessions only).

   This option provides support for Radius Termination-Action for time- and volume-based subscribers working in conjunction with an external Radius server. Enforcement of this attribute will result in either:

   - logout of the subscriber
   - re-authentication of the subscriber through issuance of a new Radius Access-Request that contains a new Acct-Session ID.

   The Radius re-authentication that occurs due to term-action enforcement will be transparent to the subscriber. This is true for time based sessions that expire, as well.

Radius accounting augmentation will take place as a result of a successful re-authentication.



The following VSAs are used for implementation of volume- and time-based Radius termination action:

VSA Name	Value
Termination-Action	1
Session-Timeout	60
Nomadix-MaxBytesDown	3000000
Nomadix-MaxBytesUp	3000000

10. If required, check the box for **Enable Session-Terminate-End-Of-Day When Authorized** (to allow business policies that want to terminate the session at midnight of every day).
11. If required, check the box for **Enable Byte Count Reset On Account Start** (to reset the transmitted and received byte count for a subscriber once an “accounting start” is sent). This function prevents counting Walled Garden traffic if the billing plan is using bytes sent/received as a charge criterion.

12. If required, check the box for **Enable RADIUS Subnet Attribute** (if you want to allocate a specific subnet to a user).
13. If required, check the box for **Enable Goodbye URL** (if you want the system to display a post session “goodbye” page). The “goodbye” page can be defined as a RADIUS VSA or be driven by the Access Gateway’s Internal Web Server (IWS).
14. If required, check the box **Enable Forget your Password** to create a link that users can go to (and is added to the passthrough list) so they can run a page at their ISP to get their password.
15. Enable or disable the **User Session Time Adjustment** and credit functionality when the NSE is down.
16. **Enable charging for idle time** to count idle time in the session time of Radius accounting packets.
17. **Enable RADIUS QoS Policies** to assign a QoS policy to a user in their Radius Profile.
18. Click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset all the values to their previous state.

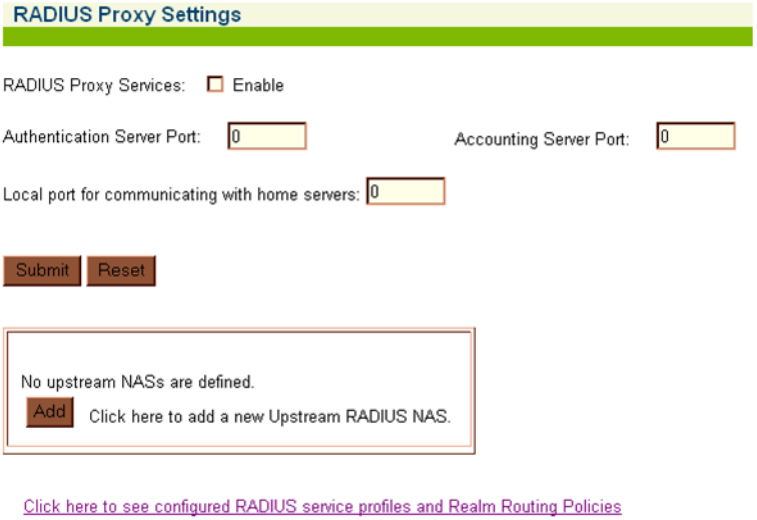
Defining the RADIUS Proxy Settings {RADIUS Proxy}

A RADIUS Proxy allows the NSE to relay authentication and accounting packets between the parties performing the authentication process. Different realms can be set up to directly channel RADIUS messages to the various RADIUS servers.

For additional RADIUS information, see also:

- “Setting up Quality of Service {QoS}” on page 148
- “Defining the Realm-Based Routing Settings {Realm-Based Routing}” on page 158
- “RADIUS Attributes” on page 317

1. From the Web Management Interface, click on **Configuration**, then **RADIUS Proxy**. The *RADIUS Proxy Settings* screen appears:

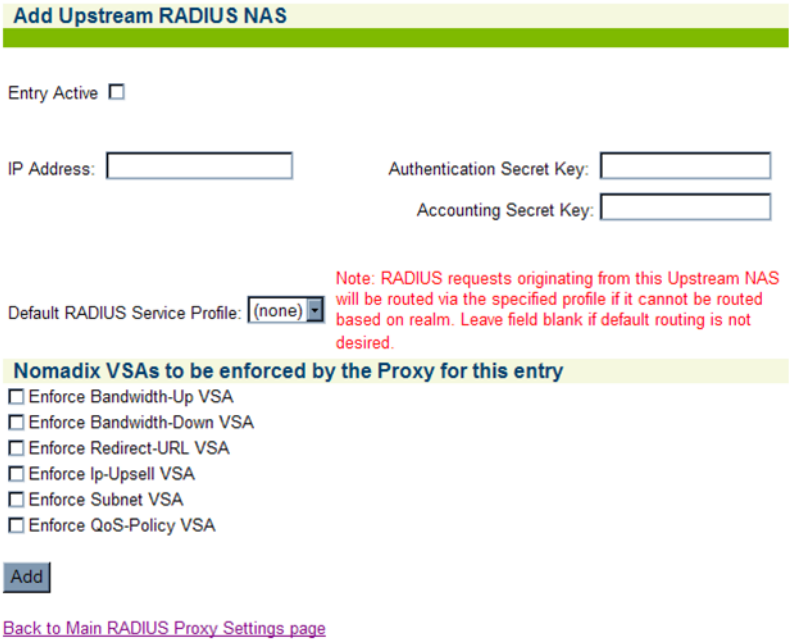


2. Enable or disable **RADIUS Proxy Services**, as required, by clicking on the appropriate check box.
3. If you enabled RADIUS Proxy Services, you must provide the Authentication Server Port and the **Accounting Server Port** references.
4. Click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset all the values to their previous state.

See Adding an Upstream RADIUS NAS.

Adding an Upstream RADIUS NAS

1. If you want to add a new Upstream RADIUS NAS (for example, an 802.11 Access Point on the subscriber side of the Access Gateway), click on the **Add** button. The *Add Upstream RADIUS NAS* screen appears:


Add Upstream RADIUS NAS
Entry Active
IP Address:
Authentication Secret Key:
Accounting Secret Key:
Default RADIUS Service Profile: (none)
Note: RADIUS requests originating from this Upstream NAS will be routed via the specified profile if it cannot be routed based on realm. Leave field blank if default routing is not desired.
Nomadix VSAs to be enforced by the Proxy for this entry
Enforce Bandwidth-Up VSA
Enforce Bandwidth-Down VSA
Enforce Redirect-URL VSA
Enforce Ip-Upsell VSA
Enforce Subnet VSA
Enforce QoS-Policy VSA
Add
Back to Main RADIUS Proxy Settings page

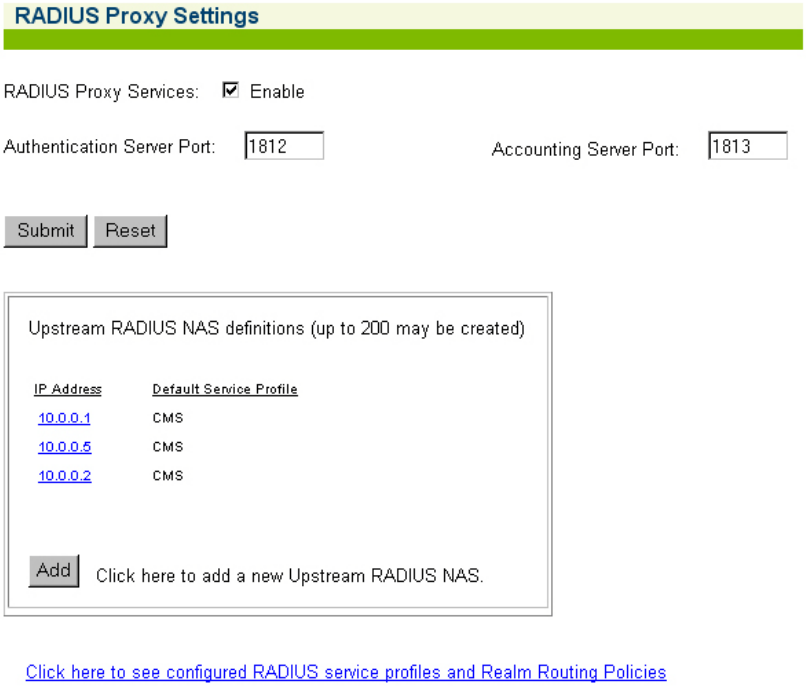
2. To make this entry the “active” NAS entry, click on the **Entry Active** check box.
3. Enter an **IP Address** for the Upstream NAS.
4. Enter a secret key in the **Authentication Secret Key** field. During the authentication process, the server and client exchange secret keys. The secret keys must match for communication between the server and the client to continue. The secret key is a valuable and necessary security measure.
5. Enter a secret key in the **Accounting Secret Key** field.
6. Select the **Default RADIUS Service Profile** from the pull-down menu (see note).

> *RADIUS requests originating from this Upstream NAS will be routed via the specified profile if it cannot be routed based on realm. Leave this field blank if default routing is not desired.*

7. Place a check in the box of the **Nomadix VSAs to be enforced by the Proxy for this entry**:
    - **Enforce Bandwidth-Up VSA**: The Radius VSA for Bandwidth-Up will be passed on to the Upstream NAS when enabled.
    - **Enforce Bandwidth-Down VSA**: The Radius VSA for Bandwidth-Down will be passed on to the Upstream NAS when enabled.
    - **Enforce Redirect-URL VSA**: The Radius VSA for Redirect-URL will be passed on to the Upstream NAS when enabled.
    - **Enforce IP-Upsell VSA**: The Radius VSA for Ip-Upsell will be passed on to the Upstream NAS when enabled.
    - **Enforce Subnet VSA**: The Radius VSA for Subnet will be passed on to the Upstream NAS when enabled.
    - **Enforce QoS-Policy VSA**: The Radius VSA for QoS-Policy will be passed on to the Upstream NAS when enabled.

See also "Defining Automatic Configuration Settings {Auto Configuration}" on page 94.Click on the **Add** button to add this Upstream RADIUS NAS definition, then click on the **Back to Main RADIUS Proxy Settings page** link to return to the *RADIUS Proxy Settings* screen.

The Upstream RADIUS NAS definition you just added appears in the list. You can add up to 10 definitions.



8. Repeat Steps 5 through 11 to add more Upstream RADIUS NAS definitions, as required.
9. To view your configured RADIUS Service Profiles and Realm Routing Policies, click on the link: **Click here to see configured RADIUS service profiles and Realm Routing Policies** (this will take you to the *Realm-Based Routing Settings* screen).

   See also, "Defining the Realm-Based Routing Settings {Realm-Based Routing}" on page 158.

Defining the Realm-Based Routing Settings {Realm-Based Routing}

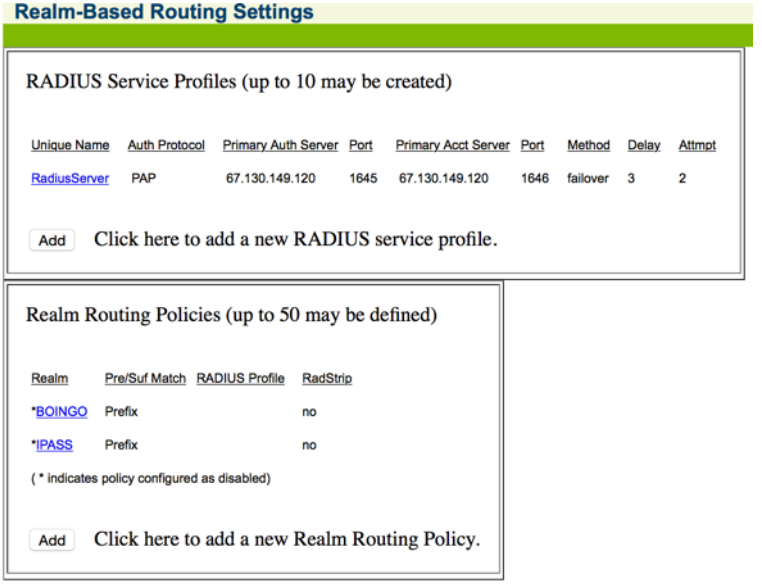
Use this procedure when setting up RADIUS Service Profiles (up to 10) and Realm-based Routing Policies (up to 50).

For additional RADIUS information, see also:

- "Setting up Quality of Service {QoS}" on page 148.
- "Defining the RADIUS Proxy Settings {RADIUS Proxy}" on page 154.

- "Setting Up the SSL Feature" on page 325

From the Web Management Interface, click on **Configuration**, then **Realm-Based Routing**. The *Realm-Based Routing Settings* screen appears:


Realm-Based Routing Settings
RADIUS Service Profiles (up to 10 may be created)
Unique Name Auth Protocol Primary Auth Server Port Primary Acct Server Port Method Delay Attmpt
RadiusServer PAP 67.130.149.120 1645 67.130.149.120 1646 failover 3 2
Add
Click here to add a new RADIUS service profile.
Realm Routing Policies (up to 50 may be defined)
Realm Pre/Suf Match RADIUS Profile RadStrip
*BOINGO Prefix no
*IPASS Prefix no
(* indicates policy configured as disabled)
Add
Click here to add a new Realm Routing Policy.

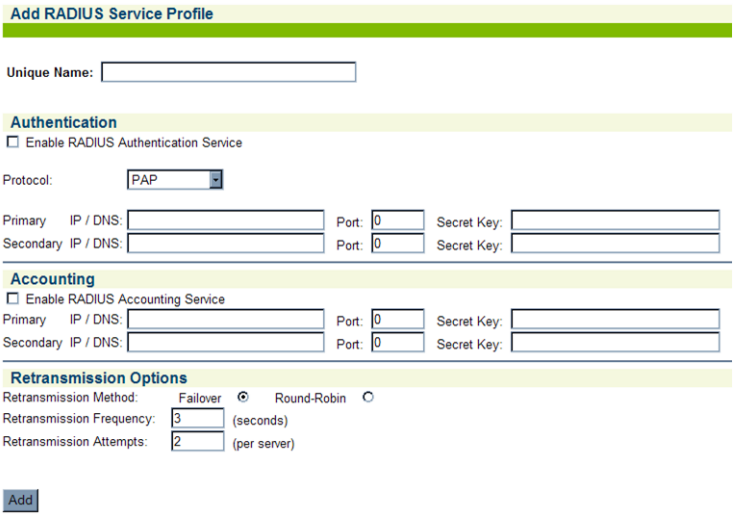
Define RADIUS Service Profiles

RADIUS service profiles are used to direct username access requests for both plain RADIUS users and users who supply realm/domain in their username. In response to a RADIUS access request, these RADIUS servers will return the L2TP tunnel parameters which the NSE will use to establish an L2TP tunnel.

Create a RADIUS service profile to a RADIUS server that will handle Prefix-based users. This is to handle users that will login with a username in the format type of "ISP/username". In this case the delimiter is "/" and what appears before it, "ISP", is the realm name.

Create a RADIUS service profile for a RADIUS server that will handle Suffix-based users. This is to handle users that will login with a username in the format type of "username@ISP.com". In this case the delimiter is "@" and what appears after it, "ISP.com", is the realm name.

To add a RADIUS Service Profile, click on the appropriate **Add** button. The *Add RADIUS Service Profile* screen appears:



Enter a name of your choice for this service profile in the **Unique Name** field.

Authentication

This category requires input for enabling RADIUS authentication and requires you to define IP addresses, ports, and secret keys for the primary and secondary RADIUS servers (the secondary server is optional).

1. Enable or disable the RADIUS Authentication Service, as required, by clicking on the **Enable RADIUS Authentication Service** check box.
2. If you enabled the RADIUS Authentication Service, enter the *primary* RADIUS authentication server IP address in the **Primary IP** field. This field can also be populated by a DNS name to allow for changing the DNS resolution, instead of having to change settings in the NSE when the IP of the Radius server changes.
3. Enter the authorization port in the **Port** field for the *primary* RADIUS authentication server. This is the port the system uses when authorizing subscribers.
4. Enter a secret key in the **Secret Key** field for the *primary* RADIUS authentication server. During the authentication process, the server and client exchange secret keys. The secret

keys must match for communication between the server and the client to continue. The secret key is a valuable and necessary security measure.

The Access Gateway and the RADIUS servers must use the same secret key.

5. Repeat Steps 2 through 4 for the *secondary* RADIUS authentication server (if used).

Accounting

This category requires input for enabling the RADIUS accounting service, and also requires the necessary IP addresses, ports and secret keys for the primary and secondary RADIUS accounting servers. The RADIUS accounting server is responsible for receiving accounting requests and returning a response to the client indicating that it has received the request.

1. To enable the accounting service for your RADIUS functionality, click on the check box for **Enable RADIUS Accounting Service**.
2. Enter the *primary* RADIUS accounting server IP address in the **Primary IP** field.
3. Enter the accounting port in the **Port** field for the *primary* RADIUS accounting server. This is the port the system uses when communicating accounting records.
4. Enter a secret key in the **Secret Key** field for the *primary* RADIUS accounting server.
5. Repeat Steps 1 through 4 for the *secondary* RADIUS accounting server (if used).

Retransmission Options

This category requires you to define the data retransmission method (failover or round-robin), the retransmission frequency, and how many retransmissions the system should attempt.

1. Select the **Retransmission Method** (*Failover* or *Round Robin*).
2. Enter a value for the time (in seconds) in the **Retransmission Frequency** field. This value determines how much time elapses between transmission attempts.
3. Enter a numeric value in the **Retransmission Attempts** (per server) field to define how many times the system attempts to transmit the data.
4. Click on the **Add** button to add this RADIUS Service Profile.
5. When you have completed the definition of your RADIUS Service Profile, you can return to the previous screen (Realm-Based Routing Settings) by clicking on the **Back to Main Realm-Based Routing Settings page** link.

   The RADIUS Service Profile you just created is added to the list.

Define Realm Routing Policies

Realm routing policies are used to determine how supplied username/password input is used to authenticate users. Create a realm routing policy for each realm that will be handled. The realm

routing policy will reference either a RADIUS service profile or a tunnel profile. Many different realm routing policies can reference the same RADIUS service or tunnel profile.

This policy references a RADIUS service profile so a realm match will result in an access request being sent to the RADIUS server(s) specified in the RADIUS service profile. In this case, the RADIUS service profile “RadiusPrefix” is referenced and so the RADIUS server(s) defined therein will receive RADIUS access requests.

Notice that the checkbox is unchecked for “Strip off routing information when sending to RADIUS server”. This box must always be unchecked in order to pass realm information to the RADIUS server(s) for matching of realm information to its defined tunnel profiles, which contain the needed tunnel parameters.

The checkbox “Strip off routing information when sending to tunnel server” may or may not be checked depending on the configuration of the tunnel server and how it will be authenticating subscribers. In this example, it is checked and so realm information will be stripped leaving only the simple username and password to be passed to the tunnel server.

The tunnel server in this case is configured to authenticate users via another RADIUS server that handles a single realm. Since it handles a single realm, no realm information is needed for users and so must be stripped. In this case, it is stripped by the NSE, but it could easily have been stripped by the tunnel server, or by the tunnel server’s RADIUS server. This is by design and for maximum flexibility.

Also note that the “Local hostname” field is blank which means that the NSE’s default local hostname of “usg_lac” will be used by the NSE. This allows for setting the local hostname to any desired value other than the default. The L2TP peers exchange their local hostnames during tunnel negotiation.

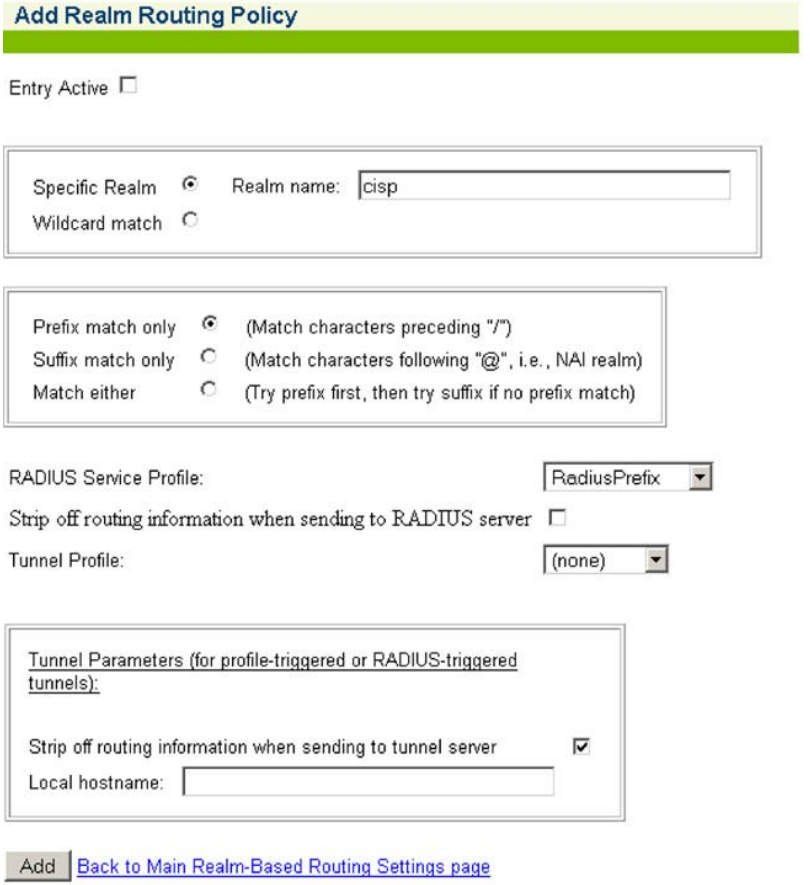
1. To add a RADIUS Service Profile, click on the appropriate **Add** button on the *Realm-Based Routing Settings* screen.

   The *Add Realm Routing Policy* screen appears:

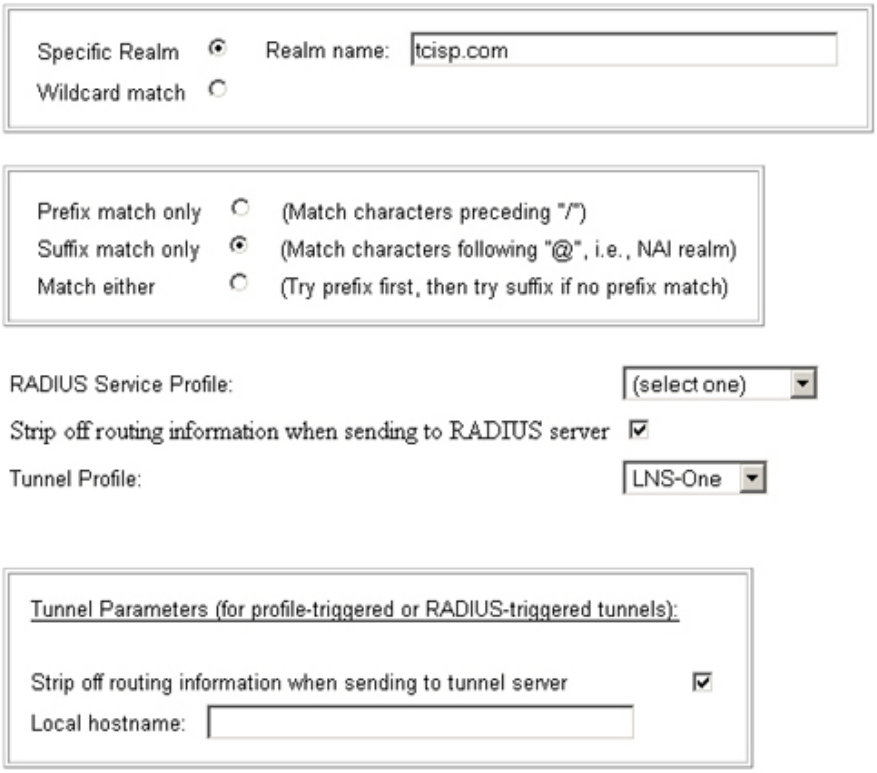
2. To make this entry the “active” entry, click on the **Entry Active** check box.
3. To define a specific realm, choose the **Specific Realm** option and enter the destination in the **Realm Name** field. Alternatively, you can choose the **Wildcard match** option, then define your search options:
   - Prefix match only
   - Suffix match only
   - Match either
4. Select the required **RADIUS Service Profile** from the pull-down menu.
5. Click on the **Strip off routing information** check box if you want to remove the routing information.

6. Click on the **Add** button to add this Realm Routing Policy.
7. When you have completed the definition of your Realm Routing Policy, you can return to the previous screen (Realm-Based Routing Settings) by clicking on the **Back to Main Realm-Based Routing Settings page** link.

   The screen below shows a realm routing policy that handles prefix-based usernames using a RADIUS service profile. Notice that “Specific Realm” is clicked and the “Realm name” is “cisp”. Also notice that “Prefix match only” is clicked and that the delimiter is “/”. This means that this realm routing policy will match usernames that are of the format “cisp/username”.


Add Realm Routing Policy
Entry Active
Specific Realm
Realm name: cisp
Wildcard match
Prefix match only
(Match characters preceding "/")
Suffix match only
(Match characters following "@", i.e., NAI realm)
Match either
(Try prefix first, then try suffix if no prefix match)
RADIUS Service Profile:
RadiusPrefix
Strip off routing information when sending to RADIUS server
Tunnel Profile:
(none)
Tunnel Parameters (for profile-triggered or RADIUS-triggered tunnels):
Strip off routing information when sending to tunnel server
Local hostname:
Add
Back to Main Realm-Based Routing Settings page

The following screen shows a realm routing policy that handles suffix-based usernames using a tunnel profile.



This differences in this example are that the realm name is “tcisp.com”, “Suffix match only” is enabled (the delimiter in this case is “@”), and a tunnel profile, “LNSOne”, is selected instead of a RADIUS service profile.

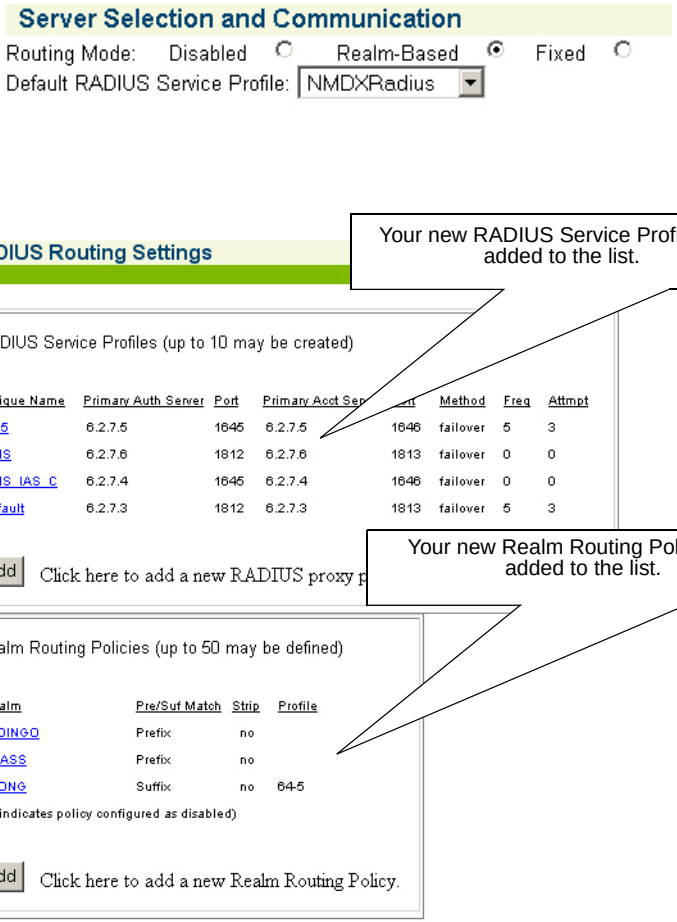
This means that this realm routing policy will match usernames that are of the format “username@tcisp.com”. Since this policy references a tunnel profile, no RADIUS access requests will be sent to any RADIUS server. In this case, the NSE will use the L2TP tunnel parameters specified in the tunnel profile to establish a tunnel and pass the username/password input to the tunnel server.

Again, as before, the username passed to the tunnel server will have realm information stripped since the checkbox for “Strip off routing information when sending to tunnel server” is checked. This checkbox may be unchecked if it is necessary for usernames to contain realm information for user authentication.

The “Local hostname” field is also blank is this example which means that the NSE will use the default value of “usg_lac” during tunnel negotiation.

Configure RADIUS Client

The NSE RADIUS client must be setup for realm-based routing mode since realm information will be used by the NSE’s L2TP tunnel feature to determine how to handle usernames that contain realm information. The screen below shows an example of setting the routing mode to handle realm-based usernames.

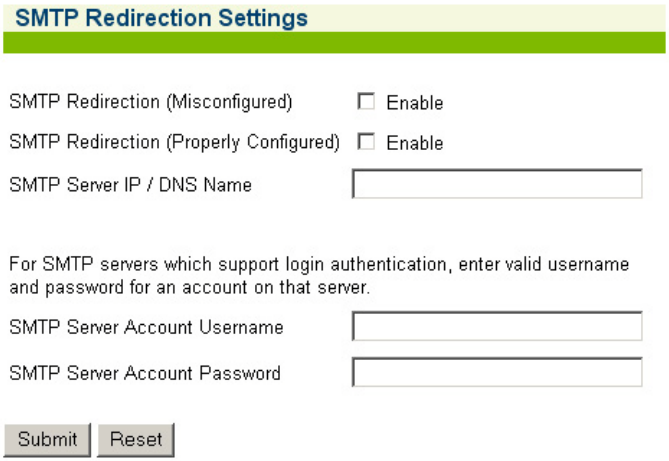

Server Selection and Communication
Routing Mode: Disabled Realm-Based Fixed
Default RADIUS Service Profile: NMDXRadius
RADIUS Routing Settings
Your new RADIUS Service Profiles are added to the list.
RADIUS Service Profiles (up to 10 may be created)
Unique Name Primary Auth Server Port Primary Acct Server Port Method Freq Attmpt
64-5 6.2.7.5 1645 6.2.7.5 1646 failover 5 3
CMS 6.2.7.6 1812 6.2.7.6 1813 failover 0 0
UMS_IAS_C 6.2.7.4 1645 6.2.7.4 1646 failover 0 0
default 6.2.7.3 1812 6.2.7.3 1813 failover 5 3
Add Click here to add a new RADIUS proxy p
Your new Realm Routing Policies are added to the list.
Realm Routing Policies (up to 50 may be defined)
Realm Pre/Suf Match Strip Profile
*BOINGO Prefix no
*IPASS Prefix no
*GONG Suffix no 64-5
(* indicates policy configured as disabled)
Add Click here to add a new Realm Routing Policy.

The Realm Routing Policy you just created is added to the list. That covers the main steps for configuring an NSE to support L2TP tunneling.

Managing SMTP Redirection {SMTP}

When SMTP redirection is enabled (for misconfigured or properly configured subscribers), the Access Gateway redirects the subscriber's E-mail through a dedicated SMTP server, including SMTP servers which support login authentication. To the subscriber, sending and receiving E-mail is as easy as it's always been. This function is transparent to subscribers.

1. From the Web Management Interface, click on **Configuration**, then **SMTP**. The *SMTP Redirection Settings* screen appears:


SMTP Redirection Settings
SMTP Redirection (Misconfigured)
Enable
SMTP Redirection (Properly Configured)
Enable
SMTP Server IP / DNS Name
For SMTP servers which support login authentication, enter valid username and password for an account on that server.
SMTP Server Account Username
SMTP Server Account Password
Submit
Reset

2. Click on the check box for **SMTP Redirection (Misconfigured)** to enable this feature for "misconfigured" subscribers.
3. Click on the check box for **SMTP Redirection (Properly Configured)** to enable this feature for "properly configured" subscribers.

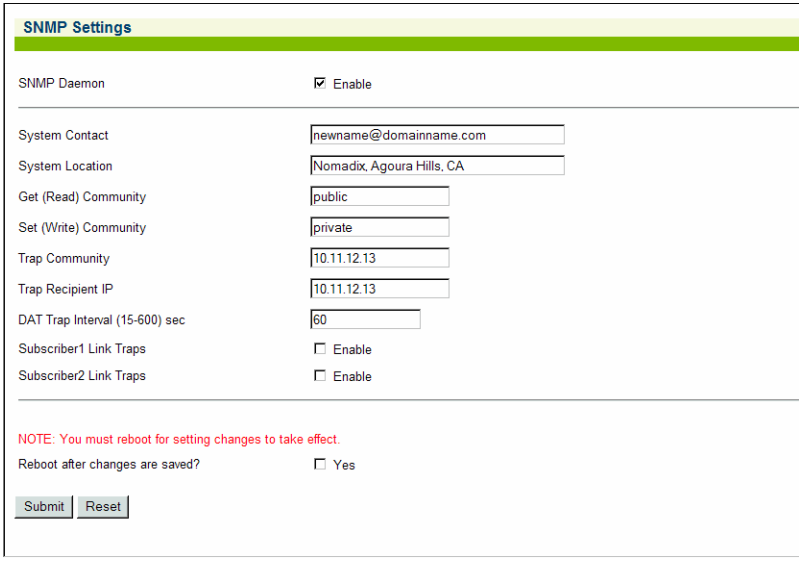
   If you enable SMTP redirection, you must provide the IP address of the SMTP server.
4. In the **SMTP Server IP/DNS** field, enter the address of the SMTP server you want to use.
5. For SMTP servers which support login authentication, enter a valid username in the **SMTP Server Account Username** field.
6. For SMTP servers which support login authentication, enter a valid password in the **SMTP Server Account Password** field.
7. Click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset all the values to their previous state.

Managing the SNMP Communities {SNMP}

You can address the Access Gateway using an SNMP client manager (for example, HP OpenView). SNMP is the standard protocol that regulates network management over the Internet. To do this, you must set up the SNMP communities and identifiers. For more information about SNMP, see "Using an SNMP Manager" on page 79.

If you want to use SNMP, you must manually turn on SNMP.

1. From the Web Management Interface, click on **Configuration**, then **SNMP**. The *SNMP Settings* screen appears:



2. Click on the check box for **SNMP Daemon** to enable this functionality.

3. Enter the SNMP parameters (communities and identifiers), including:
   - System Contact
   - System Location
   - Get (Read) Community
   - Set (Write) Community
   - Trap Community
   - Trap Recipient IP
   - Specify DAT Trap Interval (15-600) sec
   - check the box to enable Subscriber1 Link Traps
   - check the box to enable SUbscriber2 Link Traps

   Your SNMP manager needs this information to enable network management over the Internet.
4. When finished, you must reboot the system for the new settings to take effect. Click on the check box for **Reboot after changes are saved?** to reboot the system after saving your changes.
5. Click on the **Submit** button to save your changes and reboot the system, or click on the **Reset** button if you want to reset all the values to their previous state.

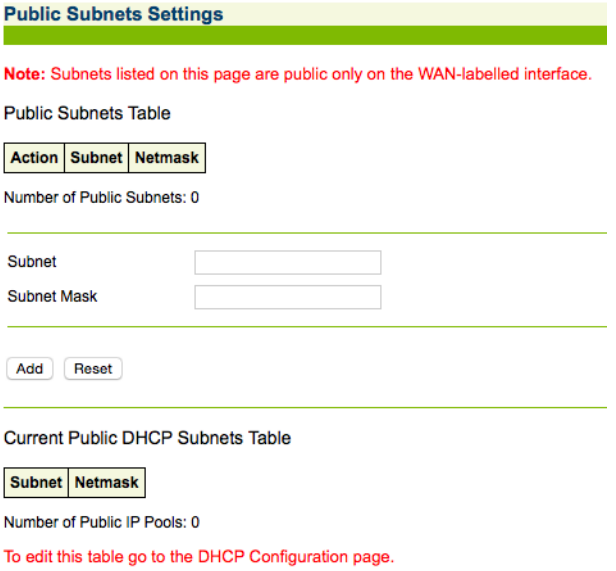
   You can now use your SNMP client to manage the Access Gateway via the Internet.

Enabling Dynamic Multiple Subnet Support (Subnets)

Nomadix' dynamic multiple subnet support allows you to create flexible and cost-effective IP pool solutions to meet the demands of complex networks in large residential and public access networks. For example:

- Establish a maximum of 15 different DHCP pools for routable IP addresses at the same time.
- Establish a maximum of 10 different public IP subnets that will not be address-translated by Nomadix' market-leading Dynamic Address Translation (DAT) feature.
- Define the user's subnet via the management interfaces.

1. From the Web Management Interface, click on **Configuration**, then **Subnets**. The *Public Subnets Settings* screen appears:



To add a Subnet

2. Enter a valid IP address for this subnet in the **Subnet** field.
3. Enter the subnet mask for this subnet in the **Subnet Mask** field.
4. Click on the **Add** button to add a new public subnet.

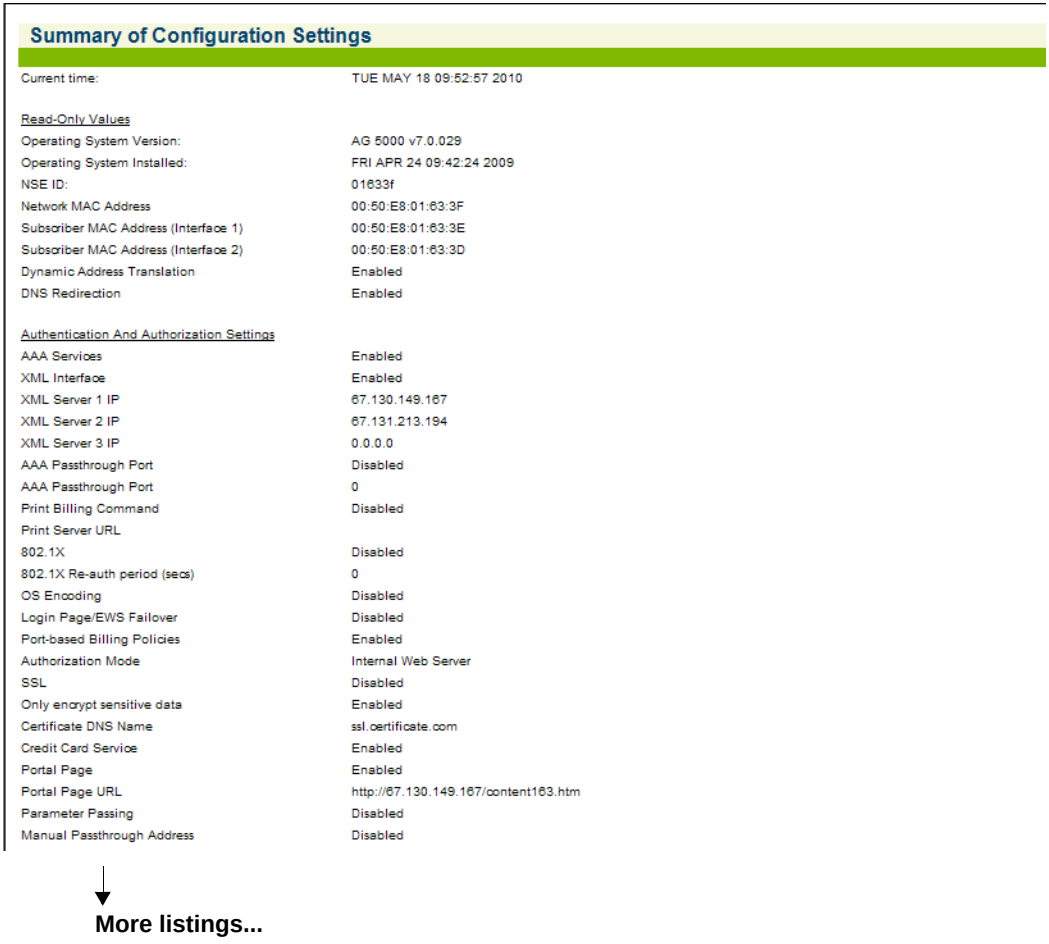
> *To edit the "Current Public DHCP Subnets" table, go to* "Managing the DHCP service options {DHCP}" on page 109.
>
> *For additional information about the multiple subnet feature, go to* "Contact Information" on page 349 *for Nomadix Technical Support.*

Displaying Your Configuration Settings {Summary}

You can display a summary listing of all your current *Configuration* settings.

To view the summary listing, go to the Web Management Interface, click on **Configuration**, then click on **Summary**.

The *Summary of Configuration Settings* screen appears (partial screen shown here):



Summary of Configuration Settings

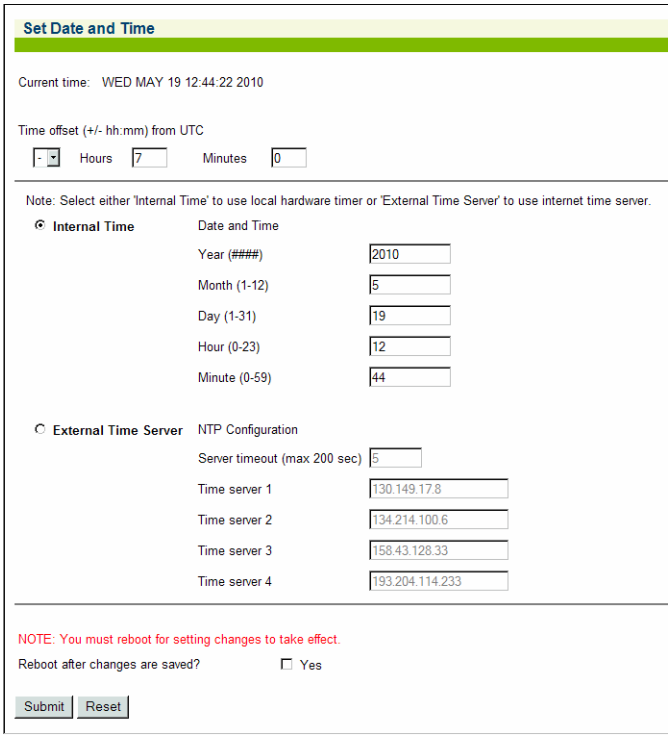
Current time:	TUE MAY 18 09:52:57 2010
Read-Only Values	
Operating System Version:	AG 5000 v7.0.029
Operating System Installed:	FRI APR 24 09:42:24 2009
NSE ID:	01633f
Network MAC Address	00:50:E8:01:63:3F
Subscriber MAC Address (Interface 1)	00:50:E8:01:63:3E
Subscriber MAC Address (Interface 2)	00:50:E8:01:63:3D
Dynamic Address Translation	Enabled
DNS Redirection	Enabled
Authentication And Authorization Settings	
AAA Services	Enabled
XML Interface	Enabled
XML Server 1 IP	67.130.149.167
XML Server 2 IP	67.131.213.194
XML Server 3 IP	0.0.0.0
AAA Passthrough Port	Disabled
AAA Passthrough Port	0
Print Billing Command	Disabled
Print Server URL	
802.1X	Disabled
802.1X Re-auth period (secs)	0
OS Encoding	Disabled
Login Page/EWS Failover	Disabled
Port-based Billing Policies	Enabled
Authorization Mode	Internal Web Server
SSL	Disabled
Only encrypt sensitive data	Enabled
Certificate DNS Name	ssl.certificate.com
Credit Card Service	Enabled
Portal Page	Enabled
Portal Page URL	http://67.130.149.167/content163.htm
Parameter Passing	Disabled
Manual Passthrough Address	Disabled

More listings...

Setting the System Date and Time {Time}

This procedure shows you how to set the system date and time.

1. From the Web Management Interface, click on **Configuration**, then **Time**. The *Set Date and Time* screen appears:


Set Date and Time
Current time: WED MAY 19 12:44:22 2010
Time offset (+/- hh:mm) from UTC
- Hours 7 Minutes 0
Note: Select either 'Internal Time' to use local hardware timer or 'External Time Server' to use internet time server.
Internal Time
Date and Time
Year (####) 2010
Month (1-12) 5
Day (1-31) 19
Hour (0-23) 12
Minute (0-59) 44
External Time Server
NTP Configuration
Server timeout (max 200 sec) 5
Time server 1 130.149.17.8
Time server 2 134.214.100.6
Time server 3 158.43.128.33
Time server 4 193.204.114.233
NOTE: You must reboot for setting changes to take effect.
Reboot after changes are saved? Yes
Submit
Reset

2. Select **Internal Time** to use the local hardware time or select **External Time Server** if you want to use NTP instead of the internal clock of the NSE.

   If you select **Internal Time**, enter the new date and time parameters in the relevant fields (if required):

   - Year (####)
   - Month (1-12)
   - Day (1-31)
   - Hour (0-23)
   - Minute (0-59)

   After entering new data for the final parameter (minutes), the system writes the information into its BIOS, then displays the new date and time.

If you select **External Time**:

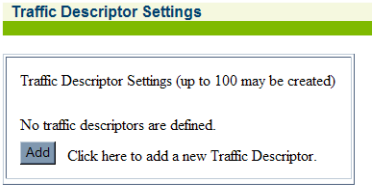
- In the **Server Timeout** field, enter the number of seconds before the NSE gives up on receiving a time response from the NTP server.
- In the **Time Server 1-4** fields, enter up to 4 different NTP servers to query for the correct time.

3. The Access Gateway also allows you to enter a "Time offset from UTC." This parameter is the Universal Coordinated Time, based on the ISO 8601 standard, and is used in conjunction with RADIUS servers (for example, if the RADIUS server is setup for a time zone that is different from the Access Gateway).
4. When finished, click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset all the values to their previous state.

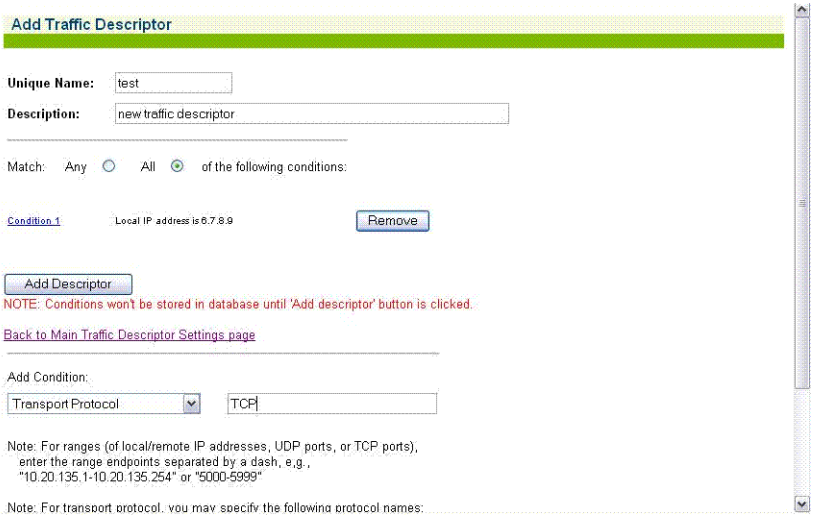
Setting up Traffic Descriptors

Traffic Descriptors are a dependency of creating rules for a Quality of Service Policy. The Traffic Descriptors are how the Access Gateway identifies subscriber traffic. They are conditions or a group of conditions that are linked to a description.

1. From the Web Management Interface, click on **Configuration**, then **Traffic Descriptor**. The *Traffic Descriptor Settings* screen appears:


Traffic Descriptor Settings
Traffic Descriptor Settings (up to 100 may be created)
No traffic descriptors are defined.
Add
Click here to add a new Traffic Descriptor.

2. Select **Add** to create a new Traffic Descriptor, or select a link to an existing descriptor to modify it. The Add Traffic Descriptor screen appears.



3. Enter a name for the descriptor in the **Unique Name** field.
4. Enter a brief summary about the descriptor in the **Description** field.
5. Set condition matching to require a match to **All** conditions or **Any** one of the conditions. This condition list displays a list of the conditions that have been defined for this descriptor.

   Select a condition type from the **Add Condition** menu and define the matching parameters. Once added, conditions will be displayed in the condition list.
6. Select **Remove** to remove a condition from this descriptor.
7. Select **Add Descriptor** to accept the parameters and conditions defined and add the descriptor to the descriptor list on the main page.

Setting Up URL Filtering {URL Filtering}

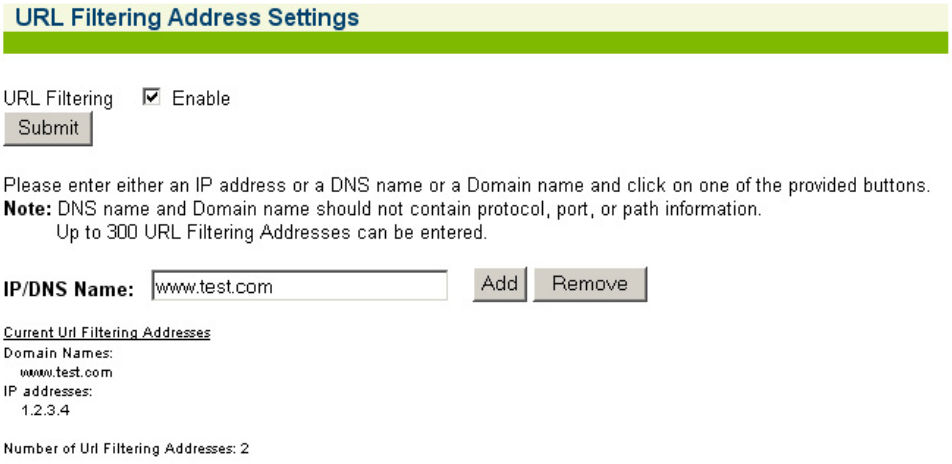
The Access Gateway can restrict access to specified Web sites based on URLs defined by the system administrator. URL filtering will block access to a list of sites and/or domains entered by the administrator using the following three methods:

- Host IP address (for example, 1.2.3.4)
- Host DNS name (for example, www.yahoo.com)

- DNS domain name (for example, *.yahoo.com, meaning all sites under the yahoo.com hierarchy, such as finance.yahoo.com, sports.yahoo.com, etc.).

The system administrator can dynamically add or remove specific IP addresses and domain names to be filtered for each property.

1. From the Web Management Interface, click on **Configuration**, then **URL Filtering**. The *URL Filtering Address Settings* screen appears:

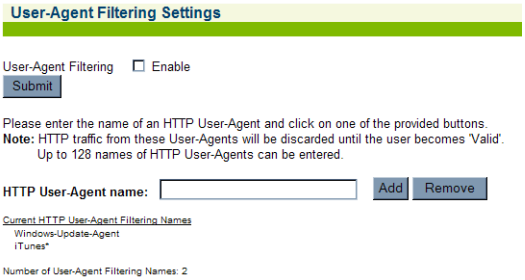

URL Filtering Address Settings
URL Filtering
Enable
Submit
Please enter either an IP address or a DNS name or a Domain name and click on one of the provided buttons.
Note: DNS name and Domain name should not contain protocol, port, or path information.
Up to 300 URL Filtering Addresses can be entered.
IP/DNS Name:
www.test.com
Add
Remove
Current Url Filtering Addresses
Domain Names:
www.test.com
IP addresses:
1.2.3.4
Number of Url Filtering Addresses: 2

2. If you want to enable this feature, click on the check box for **URL Filtering**.
3. Click on the **Submit** button to save your setting.
4. If URL Filtering is enabled, you can add (or remove) up to 300 addresses in the **IP/DNS Name** field. After entering the address you want to add, simply click on the **Add** button (the address will be added to the displayed list). Add or remove addresses, as required.

Selecting User Agent Filtering Settings

The Access Gateway can ignore traffic being generated by unsubscribed user devices that are not accessing walled garden sites or an unauthenticated users.

1. From the Web Management Interface, click on **Configuration**, then **User Agent Filtering**. The *User Agent Filtering Settings* screen appears:


User-Agent Filtering Settings
User-Agent Filtering
Enable
Submit
Please enter the name of an HTTP User-Agent and click on one of the provided buttons.
Note: HTTP traffic from these User-Agents will be discarded until the user becomes 'Valid'.
Up to 128 names of HTTP User-Agents can be entered.
HTTP User-Agent name:
Add
Remove
Current HTTP User-Agent Filtering Names
Windows-Update-Agent
iTunes*
Number of User-Agent Filtering Names: 2

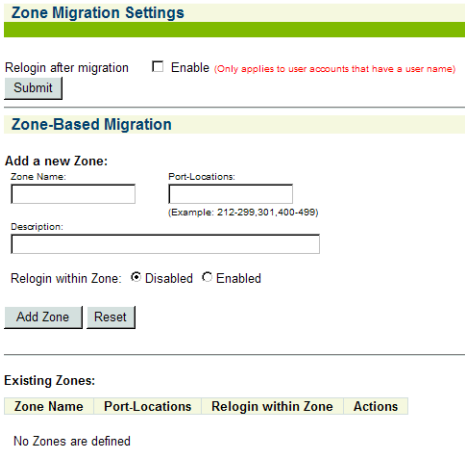
2. Enable **User-Agent Filtering** to use the filtering capabilities for the User-Agents.
3. Add the names of the different User-Agents that you want to filter to the **HTTP User-Agent name** field. Windows Update and Apple iTunes are default filtered Agents.

Zone Migration

Zone migration is an expansion of the NSE's "re-login after migration" capability, which currently allows the system to force a subscriber to log in again if the subscriber moves from one port location to another. Zone migration significantly expands this capability via the following means:

- It allows the creation of multiple zones, which are then constituted by groupings of multiple port locations. These groupings can be made up of any combination of desired ports (port values do not have to be sequential in order to be grouped within a given zone).
- The re-login requirement can then be configured so that subscribers can move from one port to another within a zone without being required to re-login. However, when moving between ports in different zones, the re-login requirement is enforced.
- It is also possible to configure a zone so that migration between ports within the zone requires the user to re-login.
- In addition, the re-login after migration function was previously limited to RADIUS and PMS users. This capability has now been extended to other subscriber login types.

1. From the Web Management Interface, click on **Configuration**, then **Zone Migration**. The *Zone Migration Settings* screen appears:



2. Select **Relogin after migration** to enable the Zone Migration feature.

Add a new Zone

In the **Zone-Based Migration** section, new zones can be added and initially configured, using the following parameter fields:

- **Zone Name** – Allows entry of a name appropriate for the zone to be created. The name must be unique, cannot exceed 16 characters, and cannot contain characters that are not alphanumeric, dash, underscore, or space.
- **Port-Locations** – This is where the port configuration for the zone is entered. The data must be entered as a string between 1 and 128 characters in length. The string must contain either an individual numeric value ("211"), a comma-separated list of numeric values ("211, 212"), a range of numeric values with dash-separated delimiters ("211-899"), a list of ranges of numeric values ("211-300, 301-899"), or a comma-separated list of individual numeric values and ranges ("211, 212, 213-899").
- **Description** – Allows entry of a description for the zone. This must be a string between 0 and 128 characters in length, and cannot contain characters that are not alphanumeric, dash, underscore, or space.

In each of these fields, any leading or trailing spaces will be removed by the NSE when the page is submitted.

Relogin within Zone

This selection provides the option to require relogin after migration between ports that are within a given zone. The default is Disabled.

Existing Zones

Zones that have already been defined are listed here, and can be edited or deleted. *(Note: The description field is not displayed in the list view).*

Defining IPSec Tunnel Settings

There are many different ways to configure, manage and monitor the performance and up-time of network devices. SNMP, Telnet, HTTP and ICMP are all common protocols to accomplish network management objectives. And within those objectives is the requirement to provide the highest level of security possible.

While several network protocols have evolved that offer some level of security and data encryption, the preferred method for attaining maximum security across all network devices is to establish an IPSec tunnel between the NOC (Network Operations Center) and the edge device (early VPN protocols such as PPTP have been widely discredited as a secure tunneling method).

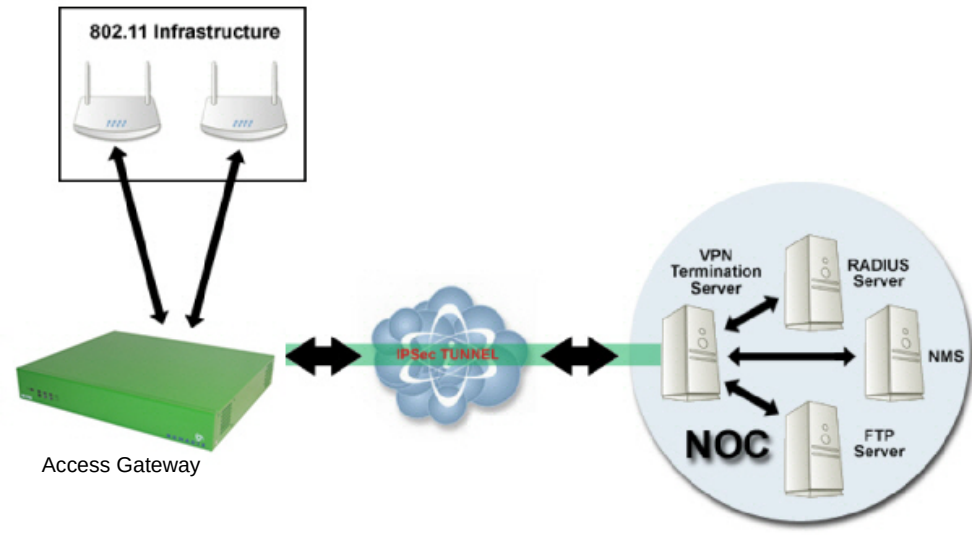
As part of Nomadix' commitment to provide outstanding carrier-class network management capabilities to its family of public access gateways, we offer secure management through the NSE's standards-driven, peer-to-peer IPSec tunneling with strong data encryption. Establishing the IPSec tunnel not only allows for the secure management of the Nomadix gateway using any preferred management protocol, but also the secure management of third party devices (for example, WLAN Access Points and 802.3 switches) on private subnets on the subscriber side of the Nomadix gateway.

The advantage of using IPSec is that all types of management traffic are supported, including the following typical examples:

- ICMP - PING from NOC to edge devices
- Telnet - Telnet from NOC to edge devices
- Web Management - HTTP access from NOC to edge devices
- SNMP
    - SNMP GET from NOC to subscriber-side device (for example, AP)
    - SNMP SET from NOC to subscriber-side device (for example, AP)
    - SNMP Trap from subscriber-side device (for example, AP) to NOC

Two subsequent events drive the secure management function of the Nomadix gateway and the devices behind it:

1. Establishing an IPSec tunnel to a centralized IPSec termination server (for example, Nortel Contivity). As part of the session establishment process, key tunnel parameters are exchanged (for example, Hash Algorithm, Security Association Lifetimes, etc.).
2. The exchange of management traffic, either originating at the NOC or from the edge device through the IPSec tunnel. Alternatively, AAA data such as RADIUS Authentication and Accounting traffic can be sent through the IPSec tunnel. See also, "Defining Automatic Configuration Settings {Auto Configuration}" on page 94.



This procedure allows system administrators to establish the peer-to-peer IPSec connection. Basic IPSec parameters must be entered by the system administrator to successfully establish the VPN session.

We recommend that you create different private subnets behind the VPN termination device and the Access Gateway.

Network Info Menu

Displaying ARP Table Entries {ARP}

You can display a table that shows the current status of the ARP (Address Resolution Protocol) assignments. ARP is used to dynamically bind a high level IP address to a low level physical hardware (MAC) address. ARP is limited to a single physical network that supports hardware broadcasting.

To view the *ARP Table*, go to the Web Management Interface, click on **Network Info**, then click on **ARP**.

The *ARP Table* screen appears:

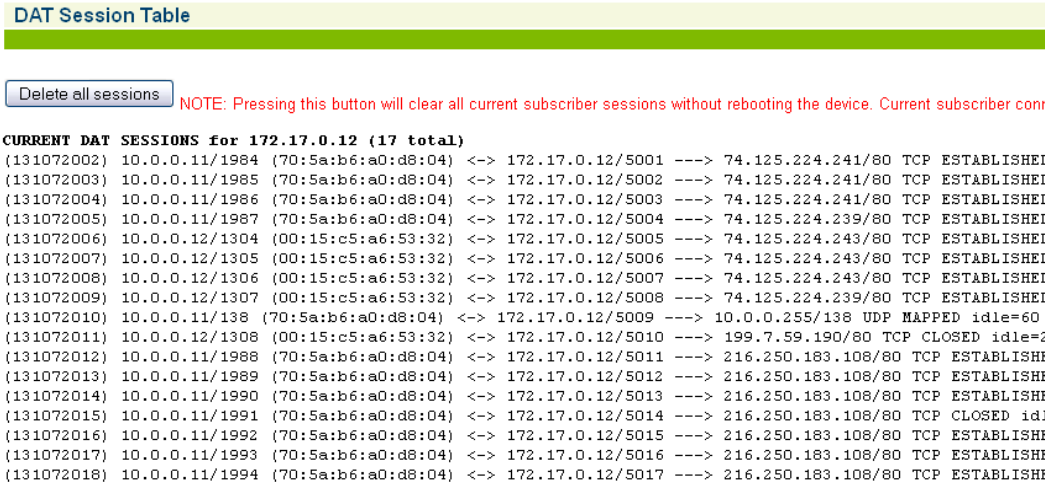
```
LINK LEVEL ARP TABLE
destination      gateway            flags  Refcnt  Use           Interface
-------------------------------------------------------------------------
1.2.3.4          00:90:27:bd:c2:df    405    1       545           fei0
2.3.4.5          00:c0:7b:81:ac:b0    405    1       0             fei0
-------------------------------------------------------------------------
```

Displaying DAT Sessions {DAT}

Dynamic Address Translation (DAT) allows all users to obtain network access, regardless of their computer's network settings.

To view the *DAT Session Table*, go to the Web Management Interface, click on **Network Info**, then click on **DAT**.

The *DAT Session Table* screen appears:



Click on the **Delete all sessions** button to clear all current subscriber sessions.

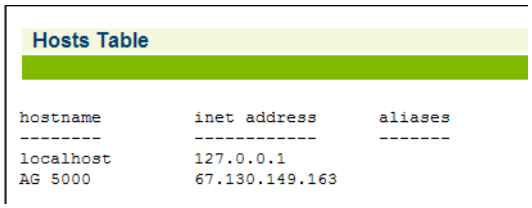
Deleting DAT sessions will cause all misconfigured subscribers to lose their Internet connection for a short period of time.

Displaying the Host Table {Hosts}

You can display a table which lists the hosts that are currently configured. This table includes the assigned host names, their corresponding IP addresses, and any aliases that may be assigned to each host. Hosts provide services to other computers that are linked to it by a network.

To view the *Host Table*, go to the Web Management Interface, click on **Network Info**, then click on **Hosts**.

The *Host Table* screen appears:

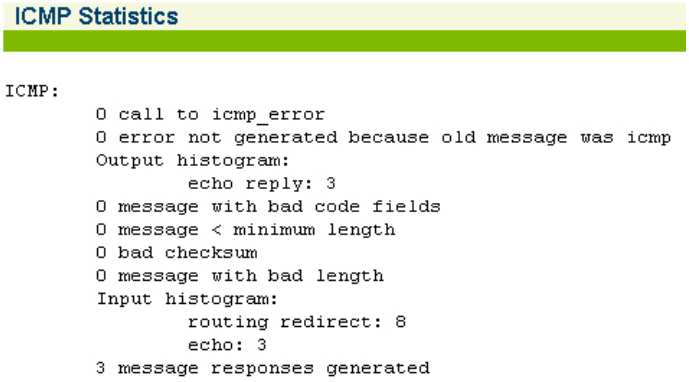


Displaying ICMP Statistics {ICMP}

You can display the current ICMP (Internet Control Message Protocol) statistics. ICMP is a standard Internet protocol that delivers error and control messages from hosts to message requesters. These statistics are presented as a listing which details the current status of each ICMP transmission element.

To view the *ICMP Statistics*, go to the Web Management Interface, click on **Network Info**, then click on **ICMP**.

The *ICMP Statistics* screen appears:



Displaying the Network Interfaces {Interfaces}

You can display the network interfaces which are presented as a detailed listing of all interface communication elements and their current status.

To view the *Network Interfaces*, go to the Web Management Interface, click on **Network Info**, then click on **Interfaces**.

The *Network Interfaces* screen appears:

Network Interfaces

```
lo (unit number 0):
     Flags: (0x48049) UP LOOPBACK MULTICAST TRAILERS ARP RUNNING INET_UP
     Type: SOFTWARE_LOOPBACK
     inet: 127.0.0.1
     Netmask 0xff000000 Subnetmask 0xff000000
     Metric is 0
     Maximum Transfer Unit size is 1536
     0 packets received; 0 packets sent
     0 multicast packets received
     0 multicast packets sent
     0 input errors; 0 output errors
     0 collisions; 0 dropped
     0 output queue drops
rtl (unit number 0):
     PHY: (BMSR=0x782d) Link up,Auto=succeeded      (BMCR=0x3000) Speed=100 Mbps,half-duplex
     Flags: (0x68043) UP BROADCAST MULTICAST ARP RUNNING INET_UP
     Type: ETHERNET_CSMACD
     inet: 172.30.30.172
     Broadcast address: 172.30.30.255
     Netmask 0xffff0000 Subnetmask 0xffffff00
     inet: 67.130.149.163
     Broadcast address: 67.130.149.191
     Netmask 0xff000000 Subnetmask 0xfffffffe0
     Ethernet address is 00:50:e8:01:63:3f
     Metric is 0
     Maximum Transfer Unit size is 1500
     235340404 octets received
     5702033 octets sent
     163906 unicast packets received
     167558 unicast packets sent
     0 non-unicast packets received
     0 non-unicast packets sent
     0 incoming packets discarded
     0 outgoing packets discarded
     0 incoming errors
     0 outgoing errors
     0 unknown protos
     0 collisions; 0 dropped
     0 output queue drops
rtl (unit number 1):
     PHY: (BMSR=0x782d) Link up,Auto=succeeded      (BMCR=0x3100) Speed=100 Mbps,full-duplex
     Flags: (0x68143) UP BROADCAST MULTICAST PROMISCUOUS ARP RUNNING INET_UP
     Type: ETHERNET_CSMACD
     Ethernet address is 00:50:e8:01:63:3e
     Metric is 0
     Maximum Transfer Unit size is 1500
     5341691 octets received
     235139037 octets sent
     82912 unicast packets received
     325878 unicast packets sent
     0 non-unicast packets received
     0 non-unicast packets sent
     0 incoming packets discarded
     0 outgoing packets discarded
     0 incoming errors
     0 outgoing errors
     1 unknown protos
     0 collisions; 0 dropped
```

Interface Monitoring

As a complementary feature to Load Balancing, you can actively monitor each WAN connection to assure that full network functionality exists.

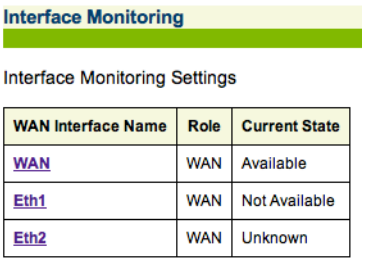
Interface Monitoring must be enabled; it is off by default. It is set separately for each configured WAN interface.

Three failures must occur before the system sets the port status to Unavailable and re-assigns subscribers.

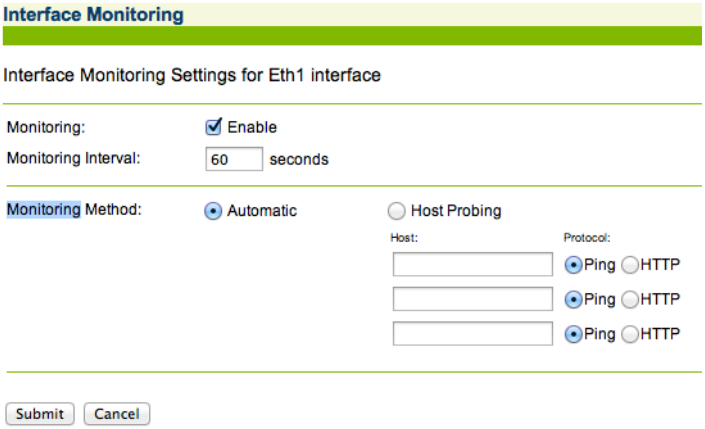
Monitoring may be configured for both the Monitoring Interval (default is 60 seconds) and for three different methods as required by the network:

- The default method (Automatic) will generate a random DNS query to each configured DNS server. Receiving an ?Error? back from the server(s) verifies full network connectivity.
- Host Probing (Ping) -A Host or IP address can be pinged to verify connectivity via ICMP response.
- Host Probing (HTTP) will generate an HTTP GET to the configured Web address. The HTTP response will verify network connectivity.

To view configured WAN interfaces, select **Configuration**>**Interface Monitoring** in the Web Management Interface. The Interface Monitoring Settings screen appears:



Click on any interface name to configure individual interface settings:

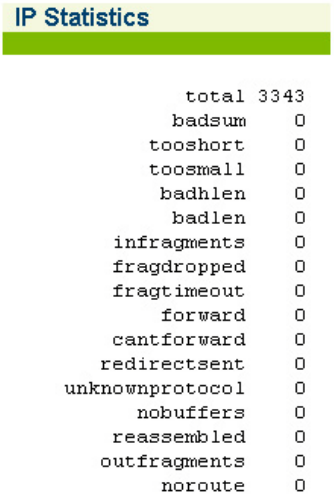


Displaying the IP Statistics {IP}

You can display the IP (Internet Protocol) statistics which are presented as a detailed listing of all IP elements and their current status. With IP transmissions, data is broken up into packets which are then sent over the network. By using IP addressing, Internet Protocol ensures that the data reaches its destination, even though different packets may “pass through” different networks to get to the same location.

To view the *IP Statistics*, go to the Web Management Interface, click on **Network Info**, then click on **IP**.

The *IP Statistics* screen appears:



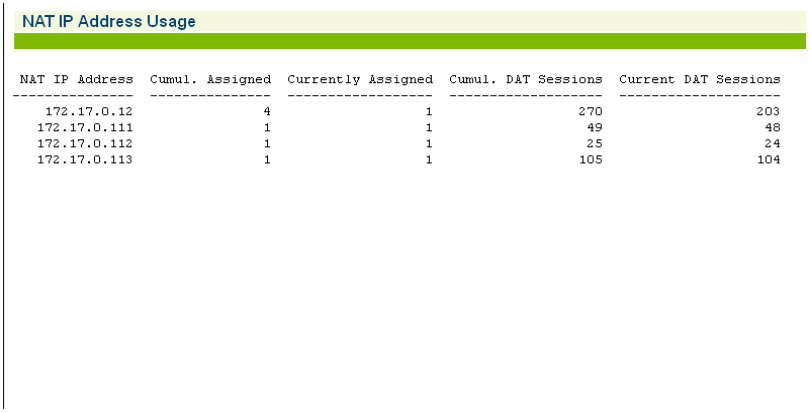
Viewing IPSec Tunnel Status {IPSec}

To view the current IPSec Tunnel Status, go to the Web Management Interface, click on **Network Info**, then click on **IPSec**.

Viewing NAT IP Address Usage {NAT IP Usage}

To view the current NAT IP Address Usage, go to the Web Management Interface, click on **Network Info**, then click on **NAT IP Usage**.

The *NAT IP Usage* summary screen appears:



NAT IP Address Usage

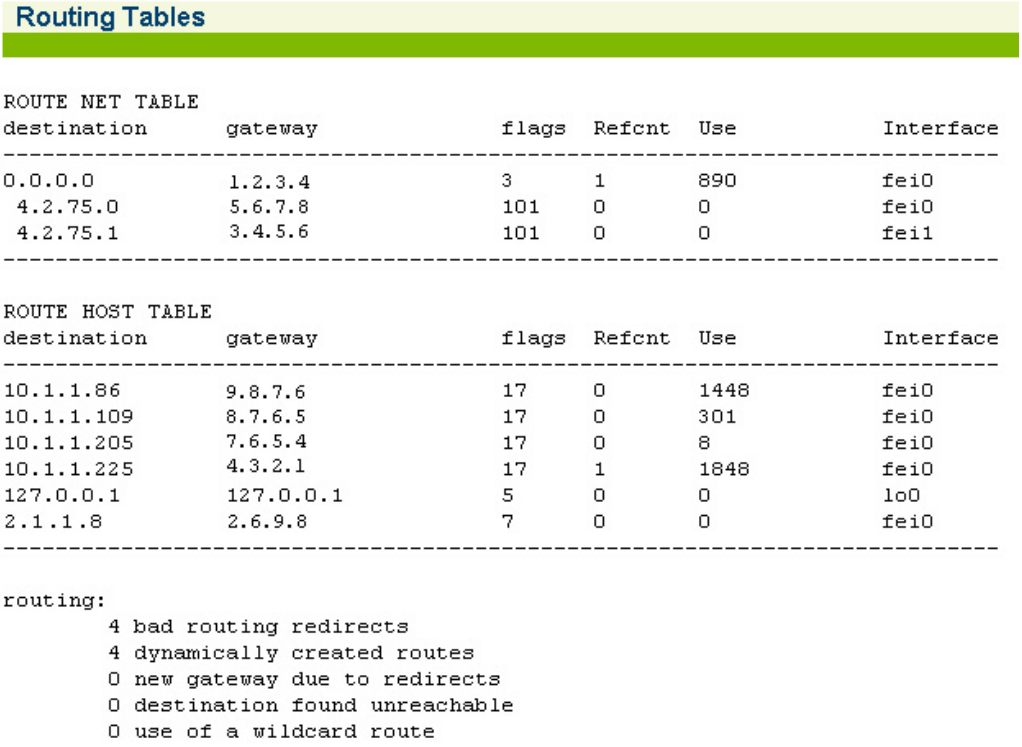
NAT IP Address	Cumul. Assigned	Currently Assigned	Cumul. DAT Sessions	Current DAT Sessions
172.17.0.12	4	1	270	203
172.17.0.111	1	1	49	48
172.17.0.112	1	1	25	24
172.17.0.113	1	1	105	104

Displaying the Routing Tables {Routing}

You can display the current *Routing Tables*, including any dynamically generated routes, unreachable routes, or wildcard routes.

To view the *Routing Tables*, select **Network Info> Routing**.

The *Routing Tables* screen appears:


Routing Tables
ROUTE NET TABLE
destination gateway flags Refcnt Use Interface
0.0.0.0 1.2.3.4 3 1 890 fei0
4.2.75.0 5.6.7.8 101 0 0 fei0
4.2.75.1 3.4.5.6 101 0 0 fei1
ROUTE HOST TABLE
destination gateway flags Refcnt Use Interface
10.1.1.86 9.8.7.6 17 0 1448 fei0
10.1.1.109 8.7.6.5 17 0 301 fei0
10.1.1.205 7.6.5.4 17 0 8 fei0
10.1.1.225 4.3.2.1 17 1 1848 fei0
127.0.0.1 127.0.0.1 5 0 0 lo0
2.1.1.8 2.6.9.8 7 0 0 fei0
routing:
4 bad routing redirects
4 dynamically created routes
0 new gateway due to redirects
0 destination found unreachable
0 use of a wildcard route

Modifying the Routing Tables {Routing}

An active routing tables view is available at **System**>**Routing**. The Routing Tables screen appears. You can make routing configuration additions and deletions from this screen. This screen includes;

- Active Routing Table, which provides routing configuration details and the ability to delete routes.

Active Routing Table

Action	Destination/Prefix	Gateway	Flags	Interface	Type
Delete	0.0.0.0/0	192.168.110.1	0x8c3	Eth1	system
Delete	0.0.0.0/0	10.0.2.1	0x8c3	Eth2	system
Delete	0.0.0.0/0	192.168.1.1	0x8c3	WAN	system
Delete	10.0.2.0/24	10.0.2.10	0x1c1	Eth2	system
Delete	10.0.2.10	10.0.2.10	0x45	Loopback	system
Delete	127.0.0.1	127.0.0.1	0x45	Loopback	system
Delete	172.30.30.0/24	172.30.30.172	0x1c1	WAN	system
Delete	172.30.30.172	172.30.30.172	0x45	Loopback	system
Delete	192.168.1.0/24	192.168.1.4	0x1c1	WAN	system
Delete	192.168.1.4	192.168.1.4	0x45	Loopback	system
Delete	192.168.110.0/24	192.168.110.25	0x1c1	Eth1	system
Delete	192.168.110.25	192.168.110.25	0x45	Loopback	system

Note: deleting an Active route that is Static or Persistent does not remove that route from the Static/Persistent Routing Table

- Static/Persistent Routing Table, grouped in a separate section for easy reference and modification.

Static/Persistent Routing Table

Action	Destination/Prefix	Gateway	Interface / Role	Type

Note: deleting a Static or Persistent route also removes that route from the Active Routing Table

- Add a New Static or Persistent Route

Add a New Static or Persistent Route

Destination IP/Prefix Length:

Gateway IP:

Interface: WAN Role: wan sub

Type: Static Persistent

Displaying the Active IP Connections {Sockets}

You can display a table which provides a detailed listing of all currently active IP (Internet Protocol) connections.

To view the *Socket Table*, go to the Web Management Interface, click on **Network Info**, then click on **Sockets**.

The *Socket Table* screen appears:

Socket Table

```
Active Internet connections (including servers)
PCB      Proto Recv-Q Send-Q  Local Address      Foreign Address    (state)
-------- ----- ------ ------  ------------------ ------------------ -------
3e6d2d8  TCP        0    742    8.6.1.7.80        3.2.8.1.18        ESTABLISHED
3e6d1d0  TCP        0      0    8.6.1.7.80        3.2.8.1.18        TIME_WAIT
3e6d0c8  TCP        0      0    8.6.1.7.80        3.2.8.1.18        TIME_WAIT
3e6cd2c  TCP        0      0    8.6.1.7.21        8.4.5.1.24        ESTABLISHED
3e6c6fc  TCP        0      0  0.0.0.0.1111        0.0.0.0.0         LISTEN
3e6c678  TCP        0      0  0.0.0.0.301         0.0.0.0.0         LISTEN
3e6c5f4  TCP        0      0  0.0.0.0.23          0.0.0.0.0         LISTEN
3e6c4ec  TCP        0      0  0.0.0.0.80          0.0.0.0.0         LISTEN
3e6c360  TCP        0      0  0.0.0.0.21          0.0.0.0.0         LISTEN
3e6c570  UDP        0      0  0.0.0.0.67          0.0.0.0.0
```

Displaying the Static Port Mapping Table {Static Port-Mapping}

You can display a table which provides a detailed listing of the currently active static port mapping scheme.

To view the *Static Port-Mapping Table*, go to the Web Management Interface, click on **Network Info**, then click on **Static Port-Mapping**.

The *Static Port-Mapping Table* screen appears:

Static Port-Mapping Table

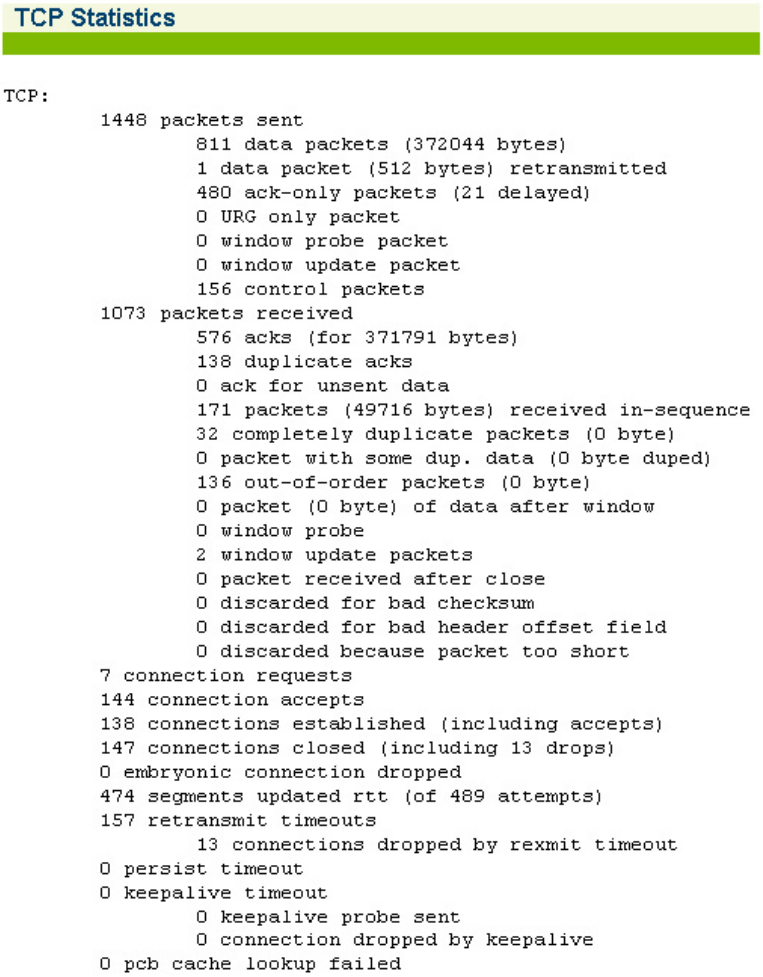
```
STATIC PORT-MAPPING TABLE
Int. IP/Int. Port (MAC) <-> Ext. IP/Ext. Port ---> Rem. IP/Rem. Port Protocol
-------------------------------------------------------------------------------

(1) 6.2.7.1/80 (00:a0:f8:53:b7:84) <-> 2.5.3.1/8080 ---> 0.0.0.0/0 TCP
(2) 10.0.0.13/23 (00:03:47:15:cd:c7) <-> 2.5.3.1/8023 ---> 0.0.0.0/0 TCP
(3) 10.208.134.5/80 (00:60:1d:31:92:c0) <-> 2.5.3.1/8081 ---> 0.0.0.0/0 TCP
(4) 12.13.14.15/80 (00:00:23:45:67:80) <-> 2.5.3.1/9000 ---> 0.0.0.0/0 TCP
(5) 10.208.134.6/6001 (00:20:a6:4c:42:ff) <-> 2.5.3.1/6001 ---> 0.0.0.0/0 TCP
-------------------------------------------------------------------------------
```

Displaying TCP Statistics {TCP}

You can display the TCP (Transmission Control Protocol) statistics which are presented as a detailed listing of all TCP elements and their current status. TCP is a standard protocol that manages data transmissions across networks.

To view the *TCP Statistics*, go to the Web Management Interface, click on **Network Info**, then click on **TCP**.

The *TCP Statistics* screen appears:

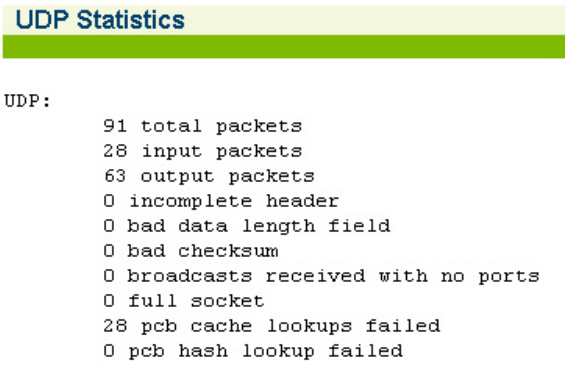

TCP Statistics
TCP:
1448 packets sent
811 data packets (372044 bytes)
1 data packet (512 bytes) retransmitted
480 ack-only packets (21 delayed)
0 URG only packet
0 window probe packet
0 window update packet
156 control packets
1073 packets received
576 acks (for 371791 bytes)
138 duplicate acks
0 ack for unsent data
171 packets (49716 bytes) received in-sequence
32 completely duplicate packets (0 byte)
0 packet with some dup. data (0 byte duped)
136 out-of-order packets (0 byte)
0 packet (0 byte) of data after window
0 window probe
2 window update packets
0 packet received after close
0 discarded for bad checksum
0 discarded for bad header offset field
0 discarded because packet too short
7 connection requests
144 connection accepts
138 connections established (including accepts)
147 connections closed (including 13 drops)
0 embryonic connection dropped
474 segments updated rtt (of 489 attempts)
157 retransmit timeouts
13 connections dropped by rexmit timeout
0 persist timeout
0 keepalive timeout
0 keepalive probe sent
0 connection dropped by keepalive
0 pcb cache lookup failed

Displaying UDP Statistics {UDP}

You can display the UDP (User Datagram Protocol) statistics which are presented as a detailed listing of all UDP elements and their current status. UDP is an Internet standard transport layer protocol. It is a connectionless protocol which adds a level of reliability and multiplexing to the Internet Protocol (IP).

To view the *UDP Statistics*, go to the Web Management Interface, click on **Network Info**, then click on **UDP**.

The *UDP Statistics* screen appears:

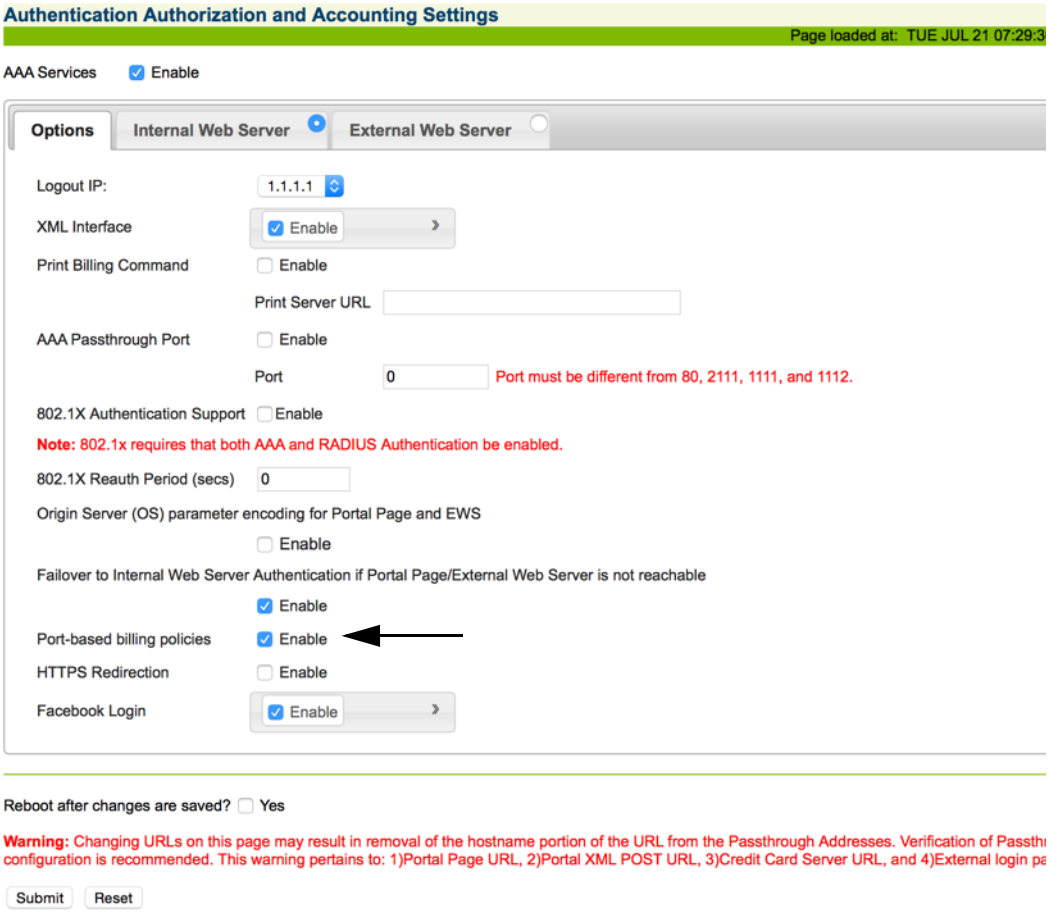


Port-Location Menu

The Port Location capabilities on the NSE have been enhanced. It is now possible to define a policy on a port. The billing methods (RADIUS, Credit Card, PMS) and the billing plans available on each port can now be individually configured.

This ability allows for having different billing methods and billing plans on different ports of the NSE. A practical application of this feature is to have a normal hotel room with a plan A that is $9.99 for a day with PMS billing and have a meeting room with a plan of $14.99 an hour with Credit Card billing.

This feature is called Port-based Policies. Port-based Policies must be enabled from the **Configuration**->**AAA** page.


Authentication Authorization and Accounting Settings
Page loaded at: TUE JUL 21 07:29:3
AAA Services
Enable
Options
Internal Web Server
External Web Server
Logout IP:
1.1.1.1
XML Interface
Enable
Print Billing Command
Enable
Print Server URL
AAA Passthrough Port
Enable
Port
0
Port must be different from 80, 2111, 1111, and 1112.
802.1X Authentication Support
Enable
Note: 802.1x requires that both AAA and RADIUS Authentication be enabled.
802.1X Reauth Period (secs)
0
Origin Server (OS) parameter encoding for Portal Page and EWS
Enable
Failover to Internal Web Server Authentication if Portal Page/External Web Server is not reachable
Enable
Port-based billing policies
Enable
HTTPS Redirection
Enable
Facebook Login
Enable
Reboot after changes are saved?
Yes
Warning: Changing URLs on this page may result in removal of the hostname portion of the URL from the Passthrough Addresses. Verification of Passth
configuration is recommended. This warning pertains to: 1)Portal Page URL, 2)Portal XML POST URL, 3)Credit Card Server URL, and 4)External login pa
Submit
Reset

Adding and Updating Port-Location Assignments {Add}

Port-locations can be assigned at any level (for example, a specific room in a hotel or apartment building, a floor number, wing, or building). There may even be multiple ports assigned to a single room or location. The Access Gateway uses a port-location authorization table to manage the assigned ports and ensure accurate billing for the services used by a particular port.

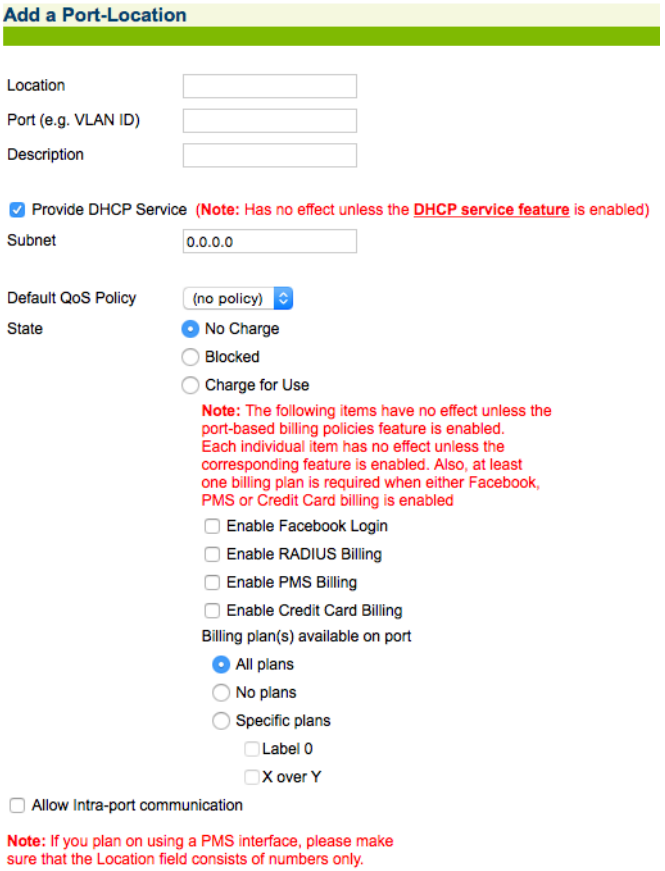
Adding a Port-Location Assignment

Updating a Port-Location Assignment

Adding a Port-Location Assignment

This procedure shows you how to add a port-location assignment. If you want to update an existing assignment, go to Updating a Port-Location Assignment.

1. From the Web Management Interface, click on **Port-Location**, then **Add**. The *Add Port-Location Assignments* screen appears:


Add a Port-Location
Location
Port (e.g. VLAN ID)
Description
Provide DHCP Service (Note: Has no effect unless the DHCP service feature is enabled)
Subnet
0.0.0.0
Default QoS Policy
(no policy)
State
No Charge
Blocked
Charge for Use
Note: The following items have no effect unless the port-based billing policies feature is enabled. Each individual item has no effect unless the corresponding feature is enabled. Also, at least one billing plan is required when either Facebook, PMS or Credit Card billing is enabled
Enable Facebook Login
Enable RADIUS Billing
Enable PMS Billing
Enable Credit Card Billing
Billing plan(s) available on port
All plans
No plans
Specific plans
Label 0
X over Y
Allow Intra-port communication
Note: If you plan on using a PMS interface, please make sure that the Location field consists of numbers only.

2. Enter a location identifier in the **Location** field. Locations can be assigned as an alpha, numeric, or alpha-numeric value *unless a PMS interface is used* (see note).

If you are using a PMS interface, ensure that the "Location" field consists only of numbers (no alpha characters or symbols).

All alpha characters (used for locations and descriptions) are case-sensitive.

3. In the **Port** field, enter the port (the VLAN ID when using 802.1Q 2-way).
4. In the **Description** field, enter a meaningful description for this port-location assignment.
5. "Provide DHCP Service" is selected by default. De-select this option if you wish to disable subscriber-side DHCP for this port location. See "Managing the DHCP service options {DHCP}" on page 109.
6. Enter a **Subnet** for the port assignment you are adding.

   You must now assign a *State* for this port-location. Possible states are, *No Charge* for using this port-location, *Charge for Use*, and *Blocked*. If you do not assign a conditional state, the state is registered as "No Charge" by default.
7. If applicable, select the **Default QoS Policy** for the port assignment you are adding.
8. Select the conditional **state** you want to assign to this port-location.

   - If you choose **Charge for Use** additional configurations are available. Refer to the Note. Port-based Policies should be enabled from the **Configuration**->**AAA** page for these settings to take effect.
   - Choose **Enable Facebook Login** to allow Facebook authentication.
   - Choose **Enable RADIUS Billing** if you want RADIUS billing to be enabled on this port.
   - Choose **Enable PMS** Billing if you want PMS based room billing to be enabled on this port.
   - Choose **Enable Credit Card** Billing if you want Credit Card based billing to be enabled on this port

     You can select any number of billing methods per port.
   - Select from **Billing Plan(s) available on port**. You can assign a specific billing plan to a port, enable all existing billing plans, or assign specific billing plans to the port.

   Please note that while it is possible to set the value of a per-port configuration parameter independently of the value of the corresponding global parameter, the feature itself is disabled for a port unless both the per-port and global parameters are set to enabled. Thus:

   - RADIUS authentication for a port is enabled only if the RADIUS Client is globally enabled AND the per-port *enable RADIUS billing* parameter is set.
   - Credit card billing for a port is enabled only if Credit Card Services is globally enabled AND the per-port *enable Credit Card billing* parameter is set.

- PMS billing for a port is enabled only if PMS Services is globally enabled AND the per-port *enable PMS billing* parameter is set.
- Facebook authentication for a port is enabled only if Port-Based Policies is enabled and that port allows Facebook as an authentication type.

9. Click on the **Add** button to save your changes (the message: **Entry added or updated in the location file** appears), or click on the **Reset** button if you want to reset all the values to their previous state.

Updating a Port-Location Assignment

The procedure for updating a port-location assignment is similar to adding a port-location assignment. The difference between the two procedures is how they are presented to you. For example, if you already have port-locations assigned and you enter an existing "port" value, each data field that you go through (port, location, state, and description) displays the value currently assigned to the field.

To update a Port-Location assignment, simply update the fields with new values.

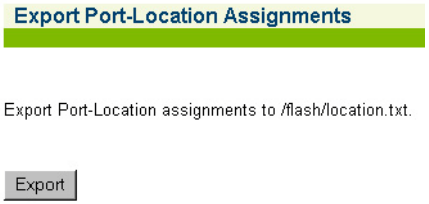
If you have updated a port-location assignment, you may want to change its description to distinguish from the old assignment. Although the old assignment will no longer exist in the system, a meaningful description can often be a valuable quick reference guide.

Exporting Port-Location Assignments {Export}

This procedure shows you how to export your current port-location assignments to the "location.txt" file. The location.txt file is stored in: /flash/location.txt (resident in the Access Gateway's flash memory).

Exporting your current port-location assignments to the Access Gateway's flash memory will overwrite the existing location.txt file.

1. From the Web Management Interface, click on **Port-Location**, then **Export**. The *Export Port-Location Assignments* screen appears:



2. Click on the **Export** button to export port-location assignment to the /flash/location.txt. file.

Finding Port-Location Assignments by Description {Find by Description}

This procedure shows you how to find a port-location assignment, based on its description. This procedure is useful if you want to review the details of a specific port-location. You can also find port-locations based on their location or port.

1. From the Web Management Interface, click on **Port-Location**, then **Find by Description**. The *Find a Port-Location Assignment by Description* screen appears:

2. In the **Enter Description** field, enter the description of the assignment you want to find.

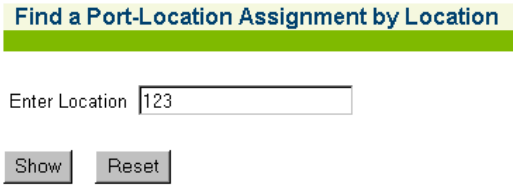
The system ignores the case (upper or lower) of the characters you enter.

3. Click on the **Show** button to view the specified port-location assignment, or click on the **Reset** button if you want to reset the “description” value to its blank state. The requested port-location is displayed:

Finding Port-Location Assignments by Location {Find by Location}

This procedure shows you how to find a port-location assignment, based on its location. This procedure is useful if you want to review the details of a specific port-location. You can also find port-locations based on their description or port.

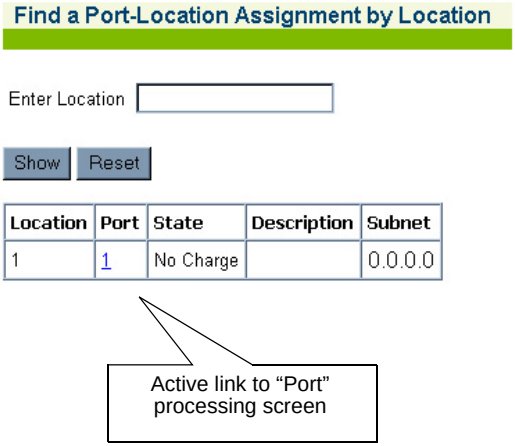
1. From the Web Management Interface, click on **Port-Location**, then **Find by Location**. The *Find a Port-Location Assignment by Location* screen appears:



2. In the **Enter Location** field, enter the location of the assignment you want to find.

The system ignores the case (upper or lower) of the characters you enter.

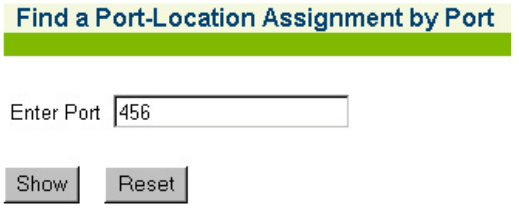
3. Click on the **Show** button to view the specified port-location assignment, or click on the **Reset** button if you want to reset the "location" value to its blank state. The requested port-location is displayed:



Finding Port-Location Assignments by Port {Find by Port}

This procedure shows you how to find a port-location assignment, based on its port. This procedure is useful if you want to review the details of a specific port-location. You can also find port-locations based on their description or location.

1. From the Web Management Interface, click on **Port-Location**, then **Find by Port**. The *Find a Port-Location Assignment by Port* screen appears:

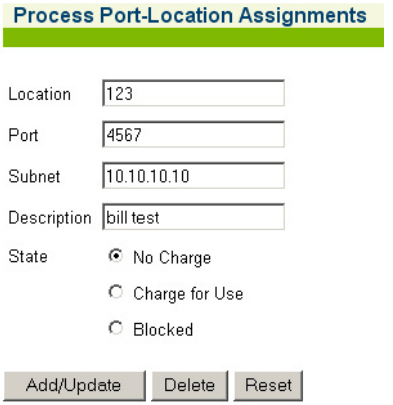


2. In the **Enter Port** field, enter the port you want to find.

The "port" is the VLAN ID (when using 802.1Q 2-way).

3. Click on the **Show** button to view the Process Port-Location Assignments screen, or click on the **Reset** button if you want to reset the "port" value to its blank state.

   From this screen you can add, update or delete port-location assignments.

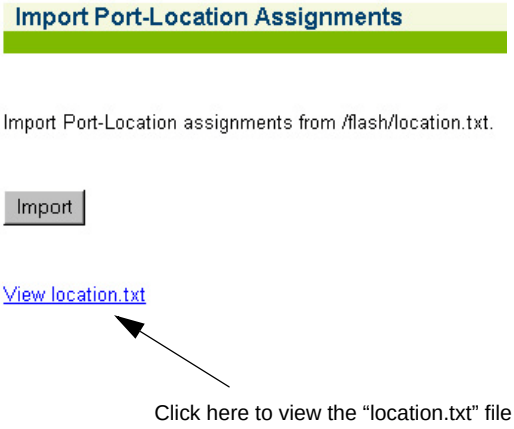


Importing Port-Location Assignments {Import}

This procedure shows you how to import port-location assignments from the “location.txt” file. The location.txt file is stored in: /flash/location.txt (resident in the Access Gateway’s flash memory).

If you have never exported port-location assignments (since installing the Access Gateway at this site), the location.txt is empty. See also, “Exporting Port-Location Assignments {Export}” on page 195. *You can create your own location.txt file, FTP to the Access Gateway’s flash directory (for example, [IP address]/flash/location.txt), and upload the file. See also,* “Creating a “location.txt” File” on page 200.

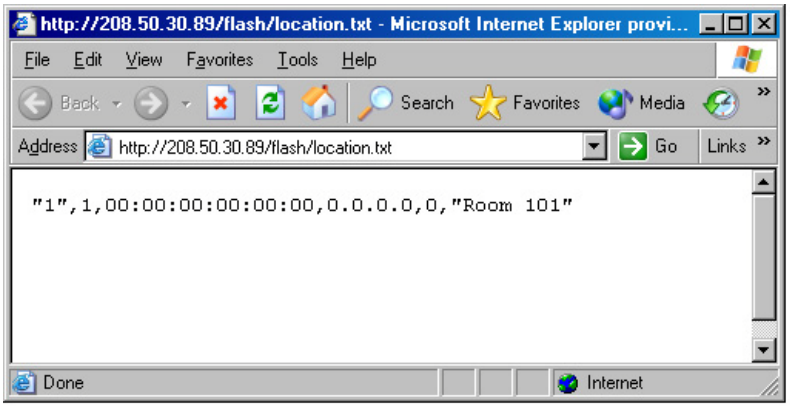
1. From the Web Management Interface, click on **Port-Location**, then **Import**. The *Import Port-Location Assignments* screen appears:



2. Click on the **Import** button to import port-location assignments from the /flash/location.txt file.

Viewing the “location.txt” File

You can click on the “View location.txt” link if you want to view the current contents of the file.



Creating a "location.txt" File

You can create your own "location.txt" file and upload the file to the Access Gateway's flash memory at *[IP address]/flash/location.txt.*

Use the following format when creating the file:

"1",1,00:00:00:00:00:00,0.0.0.0,0, "Room 101"

The 4 (four) fields used in the format represent the standard format for port-location assignments (location, port, modem MAC address for RiverDelta, subnet, state, description).

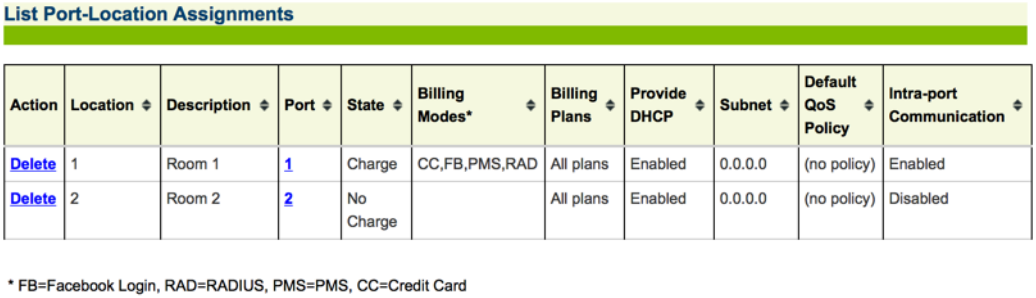
Characters (used for locations and descriptions) are case-sensitive.

- Location – Locations are assigned as an alpha, numeric, or alpha-numeric value (unless a PMS interface is used, in which case only numeric values can be used).
- Port – Any number between 1 and 65535.
- Modem MAC Address – MAC address of the modem being used.
- Subnet – Subscriber's subnet address.
- State – Possible states are: (0) no charge for using this port-location, (1) charge for use, and (2) blocked. If you do not assign a conditional state, the state is registered as "No Charge" by default.
- Description – Use a meaningful description for the assignment.

Displaying the Port-Location Mappings {List}

You can display a listing of all port-locations assigned to this system.

To view the listing of port-location assignments, select **Port-Location**>**List**. The *List Port-Location Assignments* screen appears:



List Port-Location Assignments

Action	Location	Description	Port	State	Billing Modes*	Billing Plans	Provide DHCP	Subnet	Default QoS Policy	Intra-port Communication
Delete	1	Room 1	1	Charge	CC,FB,PMS,RAD	All plans	Enabled	0.0.0.0	(no policy)	Enabled
Delete	2	Room 2	2	No Charge		All plans	Enabled	0.0.0.0	(no policy)	Disabled

* FB=Facebook Login, RAD=RADIUS, PMS=PMS, CC=Credit Card

Deleting Port-Location Assignments

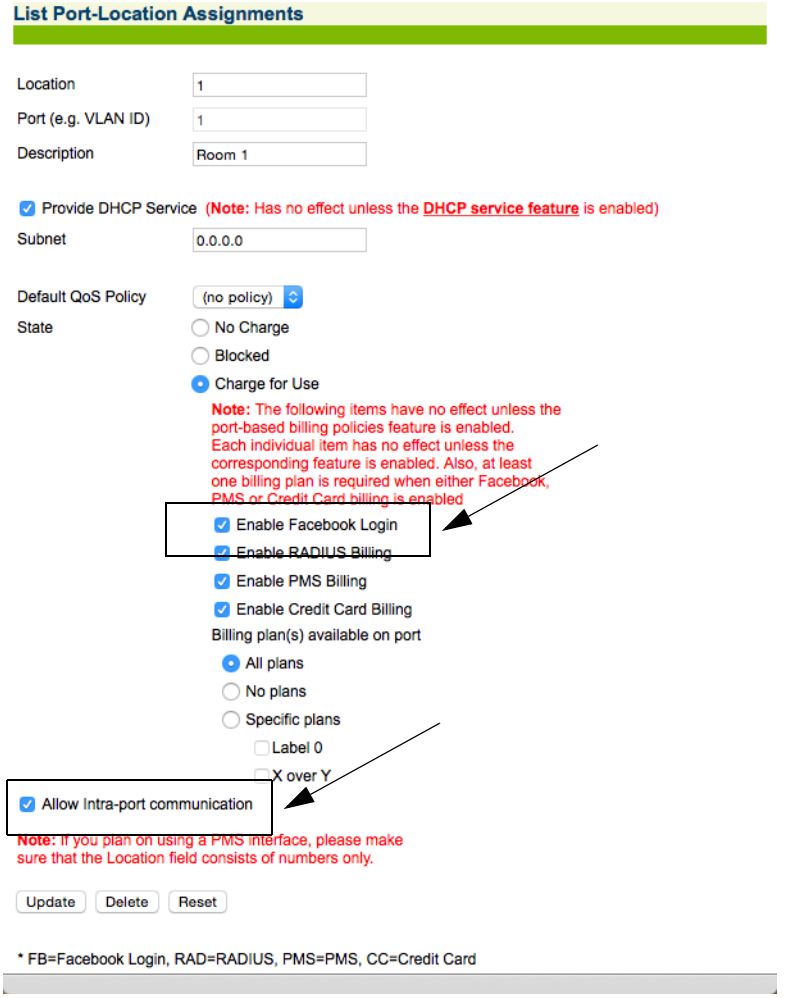
To delete port-location assignments:

1. From the Web Management Interface, select **Port-Location**>**List**.
2. Click on the **Delete** link to delete a particular port-location assignment.

You can also delete port-location assignments from the **Find by Description**, **Find by Location**, or **Find by Port** results.

Enabling Facebook Login for a Port Location

1. Click **Port-Location -> List.** Click on the **Port** number. The Process Port-Location Assignment screen appears.

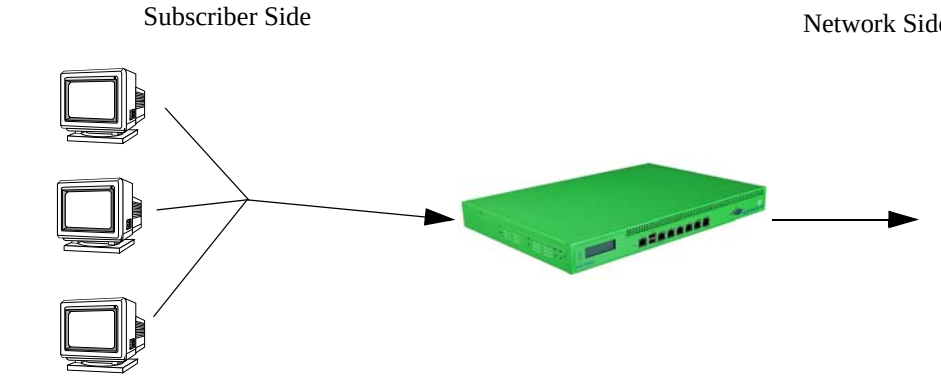

List Port-Location Assignments
Location
1
Port (e.g. VLAN ID)
1
Description
Room 1
Provide DHCP Service (Note: Has no effect unless the DHCP service feature is enabled)
Subnet
0.0.0.0
Default QoS Policy
(no policy)
State
No Charge
Blocked
Charge for Use
Note: The following items have no effect unless the port-based billing policies feature is enabled. Each individual item has no effect unless the corresponding feature is enabled. Also, at least one billing plan is required when either Facebook, PMS or Credit Card billing is enabled
Enable Facebook Login
Enable RADIUS Billing
Enable PMS Billing
Enable Credit Card Billing
Billing plan(s) available on port
All plans
No plans
Specific plans
Label 0
X over Y
Allow Intra-port communication
Note: If you plan on using a PMS interface, please make sure that the Location field consists of numbers only.
Update
Delete
Reset
* FB=Facebook Login, RAD=RADIUS, PMS=PMS, CC=Credit Card

2. Check **Enable Facebook Login.**

Subscriber Intra-Port Communication

If enabled, subscribers on a same port location (for example, a conference room) can communicate with each other without NSE intervention.

Subscribers can communicate with each other when on the same VLAN and the same IP subnet. The NSE will not respond to any ARP requests from the subscriber for other subscribers (or hosts) that are on the same port-location subnet.



Subscribers in same port/location

To enable intra-port communication

1. Click **Port-Location -> List.** Click on the **Port** number. The Process Port-Location Assignment screen appears.
2. Click **Allow Intra-port communication**.
3. Click **Add/Update**.

Subscriber Administration Menu

Adding Subscriber Profiles {Add}

This procedure shows you how to add subscriber profiles into a table of authorized users.

Three types of subscriber profiles are provided; see the following sections for configuration information for the different profile types:

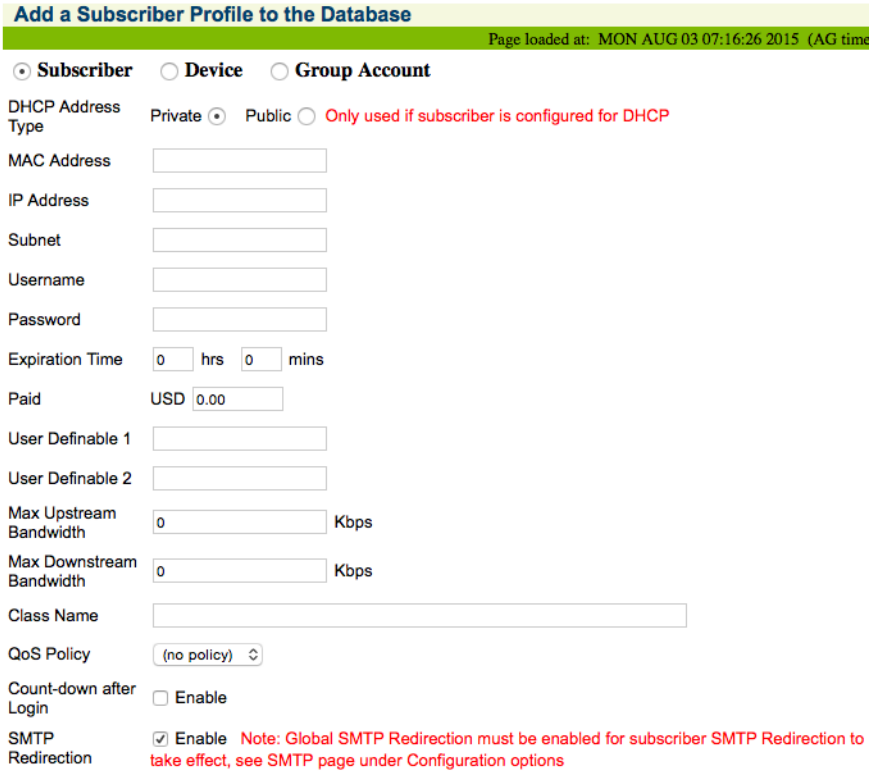
- “Adding a Subscriber Type Profile” on page 204
- “Adding a Device Type Profile” on page 206
- “Adding a Group Type Profile” on page 207

For more information about subscriber access and billing options, see the following sections:

- "Authorization and Billing" on page 272
- "Subscriber Management" on page 278
- "Subscriber Management Models" on page 278
- "Configuring the Subscriber Management Models" on page 279

Adding a Subscriber Type Profile

1. From the Web Management Interface, click on **Subscriber Administration**, then **Add**. The *Add a Subscriber Profile to the Database* screen appears:



2. Choose the **Subscriber** account type.
3. Define the DHCP Address Type: **Public** or **Private** (only used when the IP Upsell feature is enabled, otherwise leave this set to "private").
4. Enter a valid **MAC Address** for the subscriber.

If you have chosen to manage this subscriber by user name only, you do not need to enter a MAC address (but you must enter a user name).

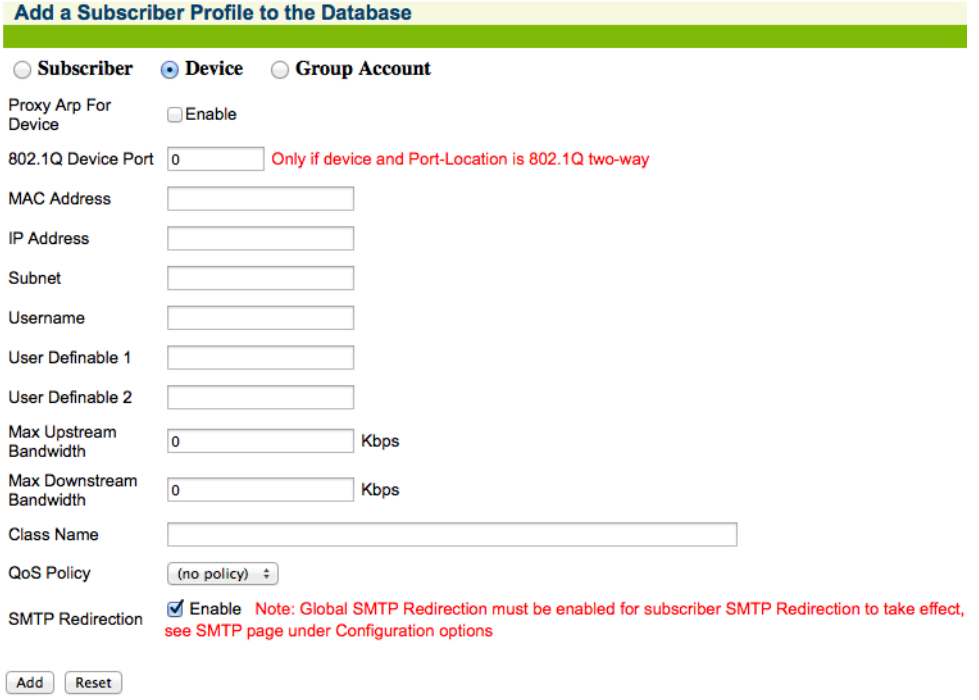
5. Enter the **IP Address** of the subscriber.
6. Enter a valid **Subnet** address for this subscriber.
7. In the **Username** field, enter a user name for this subscriber. If you entered a MAC address and you do not want to assign a user name, skip Step 9 (password).

User names and passwords are case-sensitive. Having a user name and password is an optional service that subscribers may request (for example, if they are using more than one machine, or moving between locations and they want an additional level of security). If they request this service, they are prompted at the login screen for the user name and password you assign here. Solution providers can charge a fee for this service, at their discretion.

8. If you assigned a user name, you must now assign a **Password**.
9. In the **Expiration Time** field, define the duration (in hours and minutes) for the subscriber's authorized access time. When the assigned time expires, the subscriber must "re-subscribe" to the service.
10. Enter an amount in the **Paid** field.
11. The next two fields (**User Definable 1** and **User Definable 2**) are optional. Use these fields for simple notations about the subscriber.
12. Define the **Max Upstream Bandwidth** and **Max Downstream Bandwidth** range for this subscriber (in Kbps).
13. If using Class-Based Queuing, enter the primary and subclass for this subscriber in the **Class** field. Enter these values in the format: **`<top-level class>.<subclass>`** (top-level class and subclass separated by a period)**.** See "Class-Based Queueing" on page 11 and "Class-Based Queueing" on page 102.
14. Select a policy from the **QoS Policy** menu. See "Setting up Quality of Service {QoS}" on page 148 for more information.
15. Enable **Countdown after login** if you want the timeout amount to take effect after the user logins. If the option is not enabled, user timeouts take effect the moment the subscriber is added.
16. Enable **STMP Redirection** to allow the specified user to have their SMTP traffic redirected by the global SMTP redirect configuration.
17. Click on the **Add** button to add this subscriber to the database, or click on the **Reset** button if you want to reset all the values to their previous state.

Adding a Device Type Profile

1. From the Web Management Interface, click on **Subscriber Administration**, then **Add**. The *Add a Subscriber Profile to the Database* screen appears:



2. Choose the **Device** account type for this profile.
3. If required, enable the **Proxy Arp For Device** feature.
4. Set the **802.1Q Device Port** if the device is connected to a specific VLAN.
5. Enter a valid **MAC Address** for the device.
6. Enter the **IP Address** of the device.
7. Enter a valid **Subnet** address for this device.
8. In the **Username** field, enter a user name for this device.
9. The next two fields (**User Definable 1** and **User Definable 2**) are optional. Use these fields for simple notations about the device.
10. Define the **Min Upstream Bandwidth** and **Max Upstream Bandwidth** range for this device (in Kbps).

11. Define the **Min Downstream Bandwidth** and **Max Downstream Bandwidth** range for this device (in Kbps).
12. If using Class-Based Queuing, enter the primary and subclass for this device in the **Class** field. Enter these values in the format: **`<top-level class>.<subclass>`** (top-level class and subclass separated by a period)**.** See "Class-Based Queueing" on page 11 and "Class-Based Queueing" on page 102.
13. Select a policy from the **QoS Policy** menu. See "Setting up Quality of Service {QoS}" on page 148 for more information.
14. Enable **STMP Redirection** to allow the specified user to have their SMTP traffic redirected by the global SMTP redirect configuration.

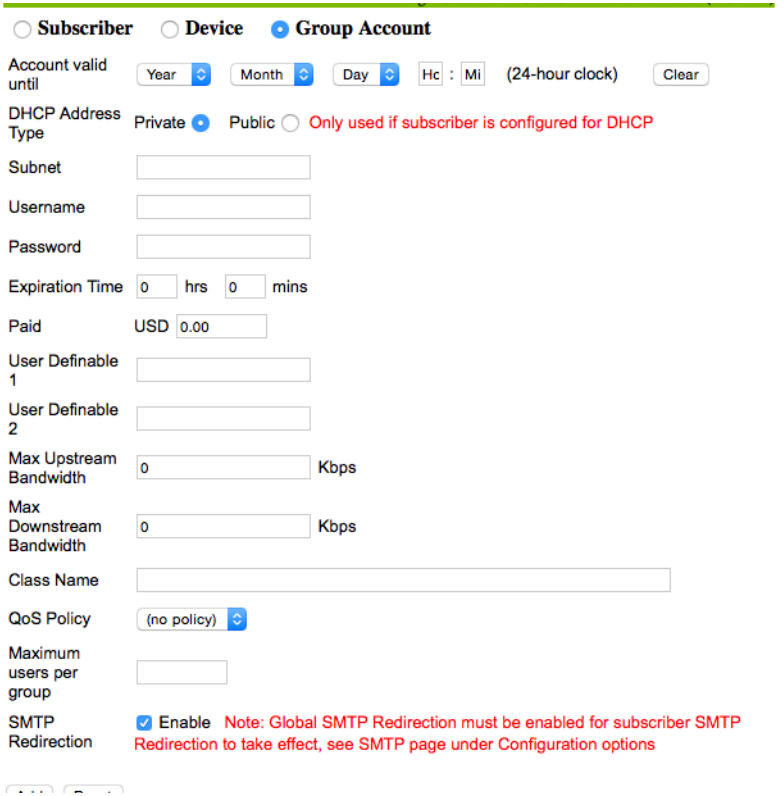
Click on the **Add** button to add this device to the database, or click on the **Reset** button if you want to reset all the values to their previous state.

Adding a Group Type Profile

Several changes have been made to improve the NSE's handling of group account administration.

- Group accounts can now be configured with a maximum user value, which limits the number of subscribers that can be logged in through the account at any given time.
- Group accounts can now be added via XML using the GROUP_ADD command.
- The overall layout and behavior of the WMI Subscriber Profile page has been modified to better reflect the configuration status of different account types, and to better support the Group Account changes:
  - The method of identifying an account as "group" has been modified. Instead of simply selecting a checkbox on the Subscriber page, group accounts now constitute a separate account "type" (along with Subscriber and Device). The Group Account checkbox has been removed from the bottom of the page, and replaced with a 'Group Account' button in the profile selection at the top.
  - A 'Maximum Users per Group' field has been added to allow setting the group user limit.

1. From the Web Management Interface, click on **Subscriber Administration**, then **Add**. The *Add a Subscriber Profile to the Database* screen appears:



2. Choose the **Group Account t**ype for this profile.
3. Set the **Account valid until** field to set an expiration date for the group account.
4. Define the DHCP Address Type: **Public** or **Private** (only used when the IP Upsell feature is enabled, otherwise leave this set to “private”).
5. Enter a valid **Subnet** address for this subscriber.
6. In the **Username** field, enter a user name for this subscriber.

   User names and passwords are required for Group Accounts.

7. If you assigned a user name, you must now assign a **Password**.

8. In the **Expiration Time** field, define the duration (in hours and minutes) for the subscriber's authorized access time. When the assigned time expires, the subscriber must "re-subscribe" to the service.
9. Enter an amount in the **Paid** field.
10. The next two fields (**User Definable 1** and **User Definable 2**) are optional. Use these fields for simple notations about the subscriber.
11. Define the **Min Upstream Bandwidth** and **Max Upstream Bandwidth** range for this subscriber (in Kbps).
12. Define the **Min Downstream Bandwidth** and **Max Downstream Bandwidth** range for this subscriber (in Kbps).
13. If using Class-Based Queuing, enter the primary and subclass for this subscriber in the **Class** field. Enter these values in the format: **`<top-level class>.<subclass>`** (top-level class and subclass separated by a period)**.** See "Class-Based Queueing" on page 11 and "Class-Based Queueing" on page 102.
14. Enter the **Maximum users per group** for the subscriber account.
15. Select a policy from the **QoS Policy** menu. See "Setting up Quality of Service {QoS}" on page 148 for more information.
16. Enable **STMP Redirection** to allow the specified user to have their SMTP traffic redirected by the global SMTP redirect configuration.

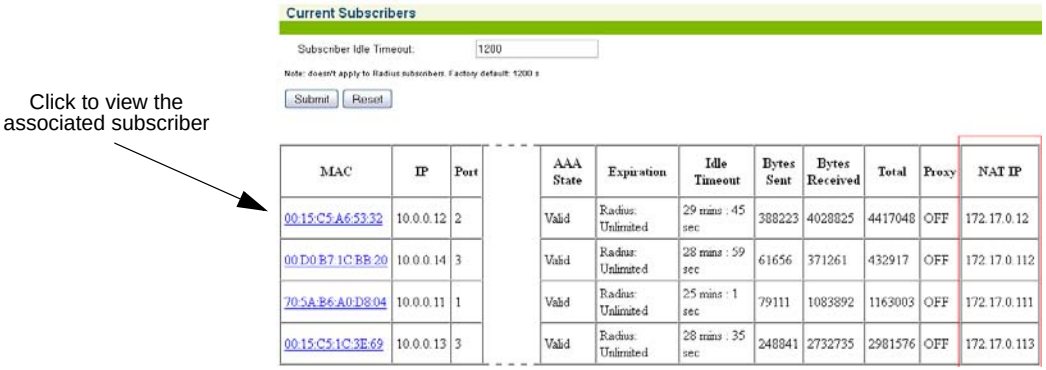
Click on the **Add** button to add this subscriber to the database, or click on the **Reset** button if you want to reset all the values to their previous state.

Displaying Current Subscriber Connections {Current}

You can display a listing of all the subscribers currently connected to the system. The list includes the MAC addresses of the subscribers, their active state, the individual expiration times, port numbers (if assigned), bandwidth limits, current bandwidth usage, and the number of bytes that have been passed from the subscriber to the Internet. This data can be used if a dispute arises between the subscriber and the solution provider (for example, if a subscriber claims that their connection to the Internet was not completed). By reviewing the "byte" statistics, you can clearly see if the subscriber made a successful connection.

To view the list of *Current Subscriber Connections*, go to the Web Management Interface, click on **Subscriber Administration**, then click on **Current**.

The *Current Subscribers* screen appears, showing the usage statistics for all subscribers currently connected to the system:

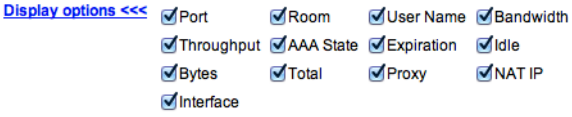


MAC	IP	Port	AAA State	Expiration	Idle Timeout	Bytes Sent	Bytes Received	Total	Proxy	NAT IP
00:15:C5:A6:53:32	10.0.0.12	2	Valid	Radius: Unlimited	29 mins : 45 sec	388223	4028825	4417048	OFF	172.17.0.12
00:D0:B7:1C:BB:20	10.0.0.14	3	Valid	Radius: Unlimited	28 mins : 59 sec	61656	371261	432917	OFF	172.17.0.112
70:5A:B6:A0:D8:04	10.0.0.11	1	Valid	Radius: Unlimited	25 mins : 1 sec	79111	1083892	1163003	OFF	172.17.0.111
00:15:C5:1C:3E:69	10.0.0.13	3	Valid	Radius: Unlimited	28 mins : 35 sec	248841	2732735	2981576	OFF	172.17.0.113

In the State field, "Valid" denotes that the subscriber has been authenticated. "Pending" indicates that the subscriber is still waiting for authentication.

To view individual subscribers, click on the linked MAC address.

ou can select specific fields to display, and can sort the Current Subscribers table on any field. Click any table header to sort on that field.



Deleting Subscriber Profiles by MAC Address {Delete by MAC}

This procedure shows you how to delete a subscriber profile from the Access Gateway's database of authorized subscribers, based on the profile's MAC address.

To see a current listing of the subscriber database, sorted by MAC addresses, go to "Listing Subscriber Profiles {List Profiles}" on page 214.

1. From the Web Management Interface, click on **Subscriber Administration**, then **Delete by MAC**. The *Delete a Subscriber Profile* (by MAC) screen appears:

2. In the **Enter MAC Address** field, enter the MAC address of the profile you want to delete.
3. Click on the **Delete** button to delete this subscriber profile, or click on the **Reset** button if you want to reset the "MAC Address" value to the 00 state.

Deleting Subscriber Profiles by User Name {Delete by User}

This procedure shows you how to delete a subscriber profile from the Access Gateway's database of authorized subscribers, based on the profile's user name.

To see a current listing of the subscriber database, sorted by user name, go to "Finding Subscriber Profiles by User Name {Find by User}" on page 214.

1. From the Web Management Interface, click on **Subscriber Administration**, then **Delete by User**. The *Delete a Subscriber Profile* (by User) screen appears:

2. In the **Username** field, enter the user name of the profile you want to delete.
3. Click on the **Delete** button to delete this subscriber profile, or click on the **Reset** button if you want to reset the "Username" value to its blank state.

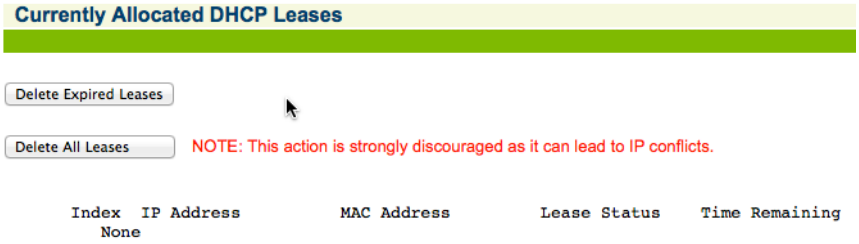
Displaying the Currently Allocated DHCP Leases {DHCP Leases}

You can display a listing of the DHCP (Dynamic Host Configuration Protocol) leases that are currently active on the system's DHCP server. DHCP is a standard method for assigning IP addresses automatically to network devices. DHCP leases define the amount of time that subscribers can utilize the system's DHCP service.

To view the list of *Currently Allocated DHCP Leases*, go to the Web Management Interface, click on **Subscriber Administration**, then click on **DHCP Leases**.

To use this feature, your Access Gateway must be set to act as its own DHCP Server. The DHCP function cannot be set to DHCP Relay. Refer to "Managing the DHCP service options {DHCP}" on page 109.

The *Currently Allocated DHCP Leases* screen appears:


Currently Allocated DHCP Leases
Delete Expired Leases
Delete All Leases
NOTE: This action is strongly discouraged as it can lead to IP conflicts.
Index IP Address MAC Address Lease Status Time Remaining
None

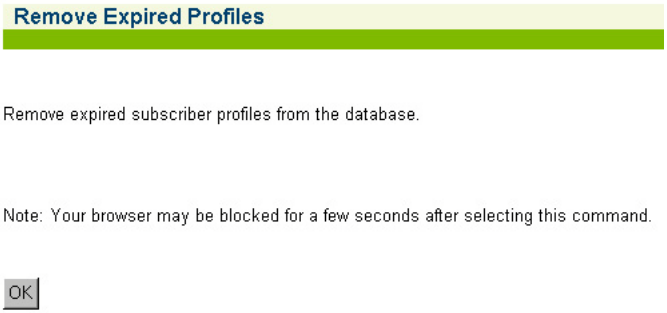
You can **Delete Expired Leases** or **Delete All Leases**.

Deleting an active DHCP lease may cause IP conflicts.

Deleting All Expired Subscriber Profiles {Expired}

This procedure shows you how to delete all expired subscriber profiles from the Access Gateway's database of authorized subscribers. Use this procedure when you want to "clean up" the subscriber database.

1. From the Web Management Interface, click on **Subscriber Administration**, then **Expired**. The *Remove Expired Profiles* screen appears:

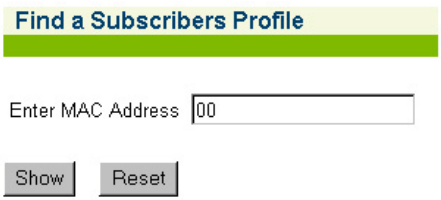

Remove Expired Profiles
Remove expired subscriber profiles from the database.
Note: Your browser may be blocked for a few seconds after selecting this command.
OK

2. Click on the **OK** button to remove all expired profiles.

Finding Subscriber Profiles by MAC Address {Find by MAC}

This procedure shows you how to find a subscriber profile from the Access Gateway's database of authorized subscribers, based on the profile's MAC address. Use this procedure when you want to see the statistics corresponding to the MAC address. Statistics include user name and password (if any) and the access time remaining for this subscriber.

1. From the Web Management Interface, click on **Subscriber Administration**, then **Find by MAC**. The *Find a Subscriber Profile* screen appears:



2. In the **Enter MAC Address** field, enter the MAC address of the subscriber you want to find.
3. Click on the **Show** button to view this subscriber profile, or click on the **Reset** button if you want to reset the "MAC Address" value to the 00 state.

Finding Subscriber Profiles by User Name {Find by User}

This procedure shows you how to find a subscriber profile from the Access Gateway's database of authorized subscribers, based on the profile's user name. Use this procedure when you want to see the statistics corresponding to the user name. Statistics include the subscriber's MAC address and the access time remaining for this subscriber.

1. From the Web Management Interface, click on **Subscriber Administration**, then **Find by User**. The *Find a Subscriber Profile* screen appears:

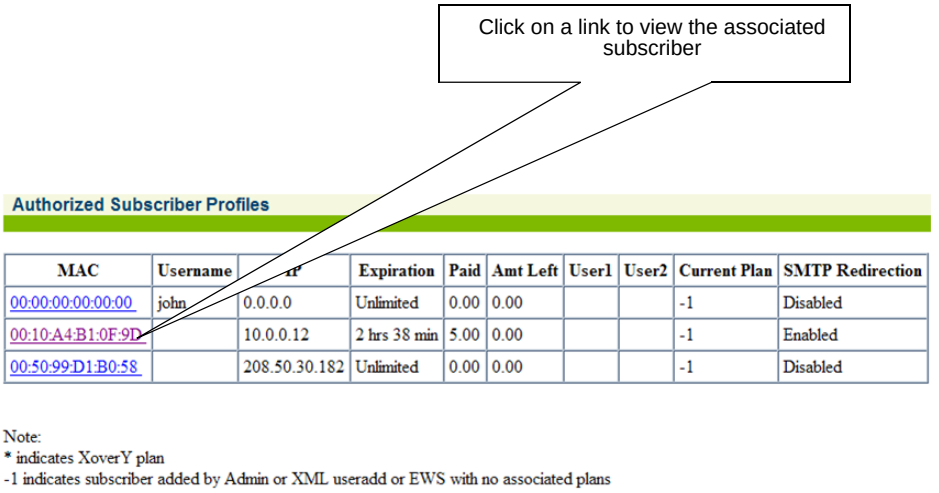
2. In the **Enter Username** field, enter the user name of the subscriber you want to find.
3. Click on the **Show** button to view this subscriber profile, or click on the **Reset** button if you want to reset the "Username" value to its blank state.

Listing Subscriber Profiles {List Profiles}

You can display the currently active database of authorized subscribers, based on user names and MAC addresses.

To view the list of *Authorized Subscriber Profiles*, go to the Web Management Interface, click on **Subscriber Administration**, then click on **List Profiles**.

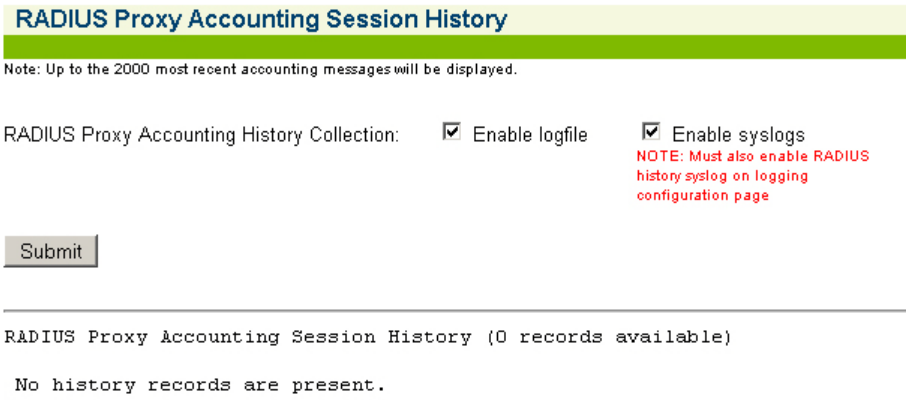
The *Authorized Subscriber Profiles* screen appears:



-1 indicates a subscriber added by Admin or XML useradd with no associated plans.

Viewing RADIUS Proxy Accounting Logs {RADIUS Session History}

These settings are available under Subscriber Administration/RADIUS Session History menu.


RADIUS Proxy Accounting Session History
Note: Up to the 2000 most recent accounting messages will be displayed.
RADIUS Proxy Accounting History Collection:
Enable logfile
Enable syslogs
NOTE: Must also enable RADIUS history syslog on logging configuration page
Submit
RADIUS Proxy Accounting Session History (0 records available)
No history records are present.

Enable Logfile checkbox

When this setting is enabled any RADIUS proxy accounting messages sent or received by the RADIUS proxy application are logged into a file named “RADHIST.RAD” in the /flash directory. This log contains accounting messages exchanged with downstream servers, and upstream NASs. The size of the log file is limited to 2000 records (accounting messages) or 320000 bytes -- when and if necessary the oldest records are purged to make room for new records.

If the logfile is disabled the current logfile is purged from the flash. If this is re-enabled again, only RADIUS accounting message sent/received from that point in time forward will be stored in the log.

Enable Syslogs checkbox

If enabled then the same information described above is sent to the configured Syslog server. The content of the syslogs is sent in human-readable format.

The configuration page of the syslog server to which these RADIUS proxy accounting messages are sent is available under the Configuration/Logging menu as described above. The third set of Syslog parameters on that page pertains to the RADIUS History Log.

Displaying Current Profiles and Connections {Statistics}

You can view the total number of profiles and connections currently stored in the Access Gateway's database of authorized subscribers. The displayed list includes the number of subscribers currently in the database (Current Table) and a numerical breakdown of how the subscribers can utilize the system (for example, free access, credit card, etc.). The total number of user profiles stored in the Access Gateway's internal database is also shown.

To view the *Subscriber Statistics*, go to the Web Management Interface, click on **Subscriber Administration**, then click on **Statistics**.

The *Subscriber Statistics* screen appears:

Subscribers in Current Table	3
Pending	1
Free Access	2
Radius	0
Credit Card	0
Property Management System	0
External Web Server	0
Added Via XML Command	0
Added by Administrator	0

USG Internal Database User Profiles	0

Subscriber Interface Menu

Defining the Billing Options {Billing Options}

- Duration-based Billing Plans

- Setting Up a “Normal” Billing Plan, including pricing and bandwidth.
- Setting Up an X over Y Billing Plan
- Messages displayed to subscribers, including an Introduction Message, Offer Message and Policy Message.
- Billing schemes (units of access).
- Free billing options (free access).
- Promotional code options (for example, when offering a percentage discount).

Duration-based Billing Plans

The purpose of this feature is to let hotels create billing plans that work in a similar fashion to pre-paid telephone cards. This means that an operator can set the Access Gateway’s Internal Web Server (IWS) to allow users online on a time “X” over period “Y” basis. Standard billing plans (where time “X” = period “Y”) can be used concurrently with “X” over “Y” plans. For example, multiple plans with flexible billing event options can be rolled out, such as:

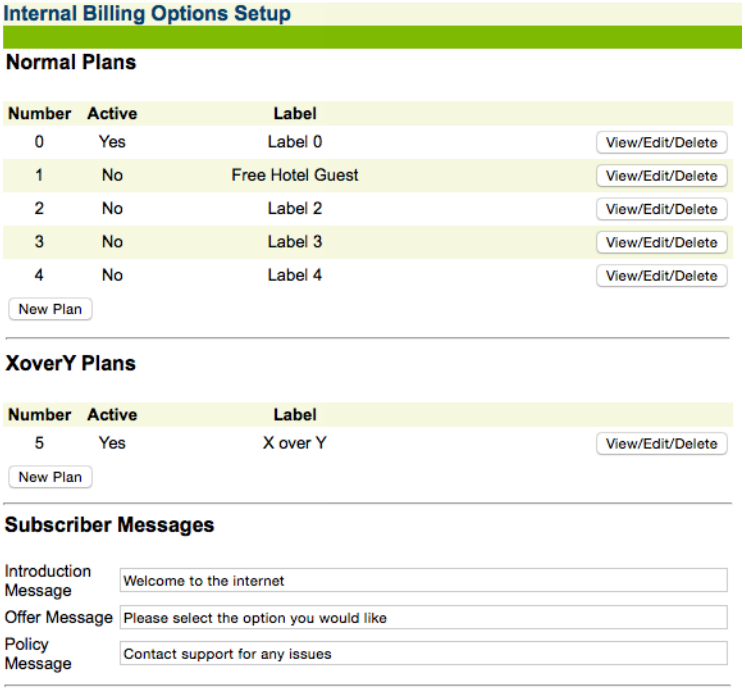
- Plan A: 24 hours, 256kbit/s downstream, 128Kbit/s upstream, public IP address, $15 charge.
- Plan B: 8 hours to be used over 5 days, 512Kbit/s downstream, 256Kbit/s upstream, private IP address, $35 charge.
- Plan C: 1 week, 1Mbit/s downstream, 1Mbit/s upstream, public IP address, $99 charge.

In addition to credit card billing, Property Management Systems used by hotels are also supported along with the internal data base of the Access Gateway and billing via Nomadix' secure XML API.

See also, “Assigning a PMS Service {PMS}” on page 136 (see following note).

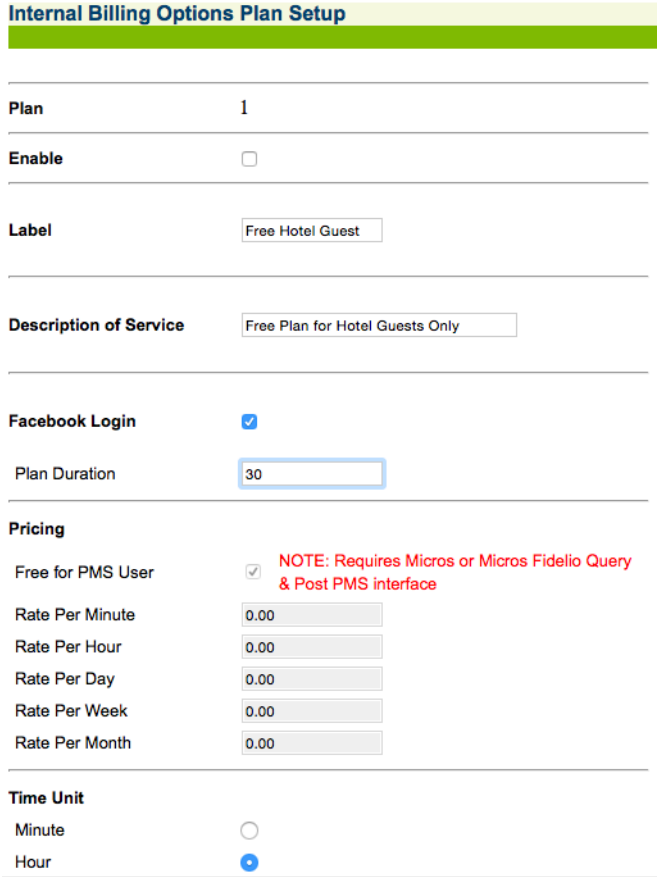
Your product license must support the PMS feature.

1. From the Web Management Interface, click on **Subscriber Interface**, then **Billing Options**. The *Internal Billing Options Setup* screen appears:

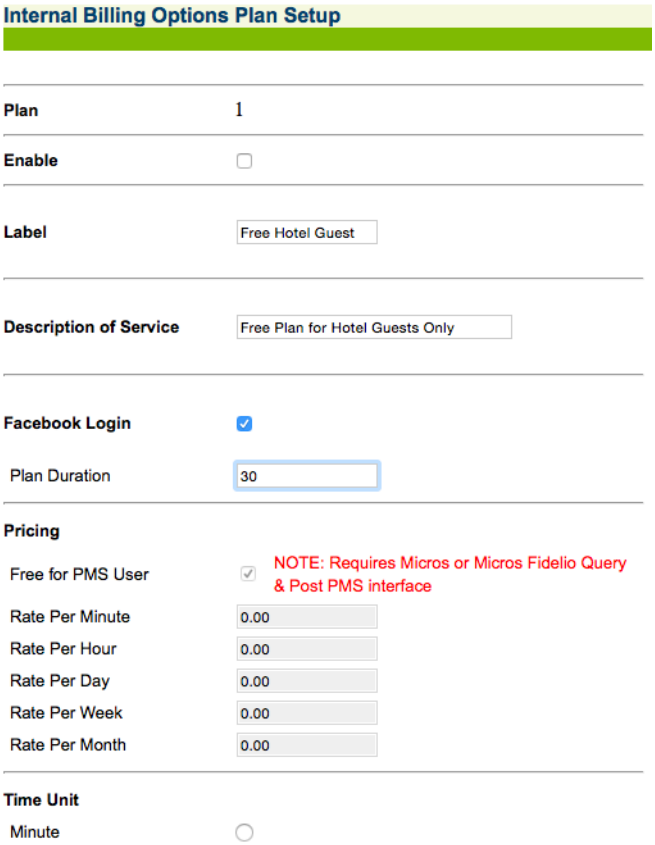


2. Review the billing plans (normal plans and X over Y plans) that are currently active. To view or edit a billing plan, click the **View/Edit/Delete** button opposite the corresponding plan.

The *Internal Billing Options Plan Setup* or *Internal Billing Options XoverY Plan Setup* screen appears for the billing plan (and type) you selected.



Sample of Internal Billing Options XoverY Plan Setup Screen



Depending on the type of plan you want to set up, go to:

- "Setting Up a "Normal" Billing Plan" on page 221.
- "Setting Up an X over Y Billing Plan" on page 223.

Setting Up a "Normal" Billing Plan

1. If required, click on the **Enable** check box to enable (make active) this billing plan.
2. Define a "label" for this billing plan in the **Label** field.

Each plan must have a unique label, different from other plans.

3. Enter a description for this billing plan in the **Description of Service** field.
4. **If desired, enable Facebook Login and specify a plan duration.**
5. Define the **Pricing** schemes for this billing plan (rate per minute, per hour, per day, per week, and per month).
6. Define the **Time Unit** of the billable event (either Minute, Hour, Day, Week, or Month). One time unit is assigned to each billing plan.

The Access Gateway allows you to define multiple billing plans with different time units at the same time. For example, you can define one billing plan that changes by the hour (e.g. $2.95 per hour) and a second plan that charges per day (e.g. $12.95 per day).

7. Define the **Up** (*to network*) and **Down** (*to subscribers*) bandwidth range for this billing plan.
8. Define the DHCP Pool (public or private) -- see following note.

The "public" option requires IP Upsell to be turned on, otherwise subscribers will receive private IP addresses.

9. If using Class-Based Queuing, enter the primary and subclass for this subscriber in the **Class** field. Enter these values in the format: **`<top-level class>.<subclass>`** (top-level class and subclass separated by a period)**.** See "Class-Based Queueing" on page 11 and "Class-Based Queueing" on page 102.
10. Click on the **Submit this Plan** button to save your changes and establish this billing plan. Alternatively, you can click on the **Delete this Plan** button if you want to delete this plan, or click on the **Reset** button if you want to reset all the values to their previous state.
11. Click on the **Back** button at any time to return to the *Internal Billing Options Setup* (previous) screen.
12. Repeat Steps 2 through 11 for each billing plan. You can enable (make active) any or all of the available billing plans.

13. Define the messages you want to present to subscribers, including:
    - Introduction Message
    - Offer Message
    - Policy Message
14. Define the **Units of Access** (Minute, Hour, Day, Week, or Month) you want to make available to subscribers.
15. If you want to allow free access to subscribers, you can define the following free billing options:
    - Default Free Access Time (in days)
    - Maximum Subscriber Lifetime (in days)
16. Define any *Promotional Code Options* in the **Code Definition** and **Percentage Discount** fields, as required. You can define up to 5 Promotional Code Options.

    The "Percentage Discount" parameter must be between 1 and 100.

17. Click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset all the values to their previous state.

Setting Up an X over Y Billing Plan

1. If required, click on the **Enable** check box to enable (make active) this billing plan.
2. Define a "label" for this billing plan in the **Label** field.

    Each plan must have a unique label, different from other plans.

3. Enter a description for this billing plan in the **Description of Service** field.
4. Enter the cost the plan in the **Plan Cost** field.
5. Enter a duration value for this plan in the **Plan Duration (X)** field.
6. Define the "time unit" for the duration value you entered in Step 5. The time unit can be defined as either **Minute**, **Hour**, or **Day**.
7. Enter plan validity value for this plan in the **Plan Validity** (Y) field.
8. Define the "time unit" for the plan validity value you entered in Step 7. The time unit can be defined as either **Day**, **Week**, or **Month**.
9. Define the **Up** (*to network*) and **Down** (*to subscribers*) bandwidth range for this billing plan.

10. Define the DHCP Pool (public or private) -- see following note.

The "public" option requires IP Upsell to be turned on, otherwise subscribers will receive private IP addresses.

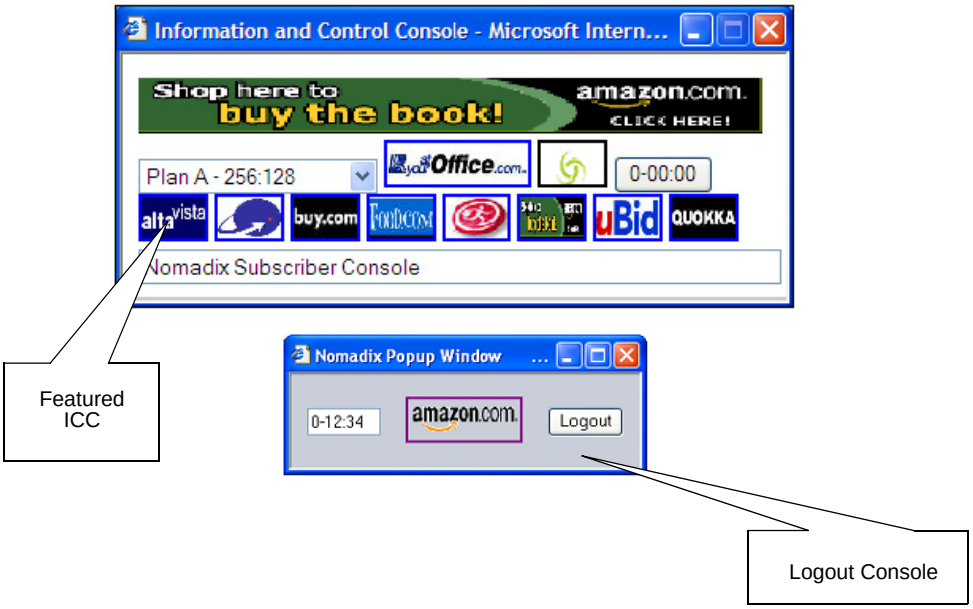
11. Click on the **Submit this Plan** button to save your changes and establish this billing plan. Alternatively, you can click on the **Delete this Plan** button if you want to delete this plan, or click on the **Reset** button if you want to reset all the values to their previous state.
12. Click on the **Back** button at any time to return to the *Internal Billing Options Setup* (previous) screen.

Setting Up the Information and Control Console {ICC Setup}

The Nomadix ICC is a HTML pop-up window that is presented to subscribers, allowing them to select their bandwidth and billing plan options quickly and efficiently, and displays a dynamic "time" field to inform them of the time remaining on their account. The ICC also offers service providers an opportunity to display advertising banners and provide a choice of redirection options.

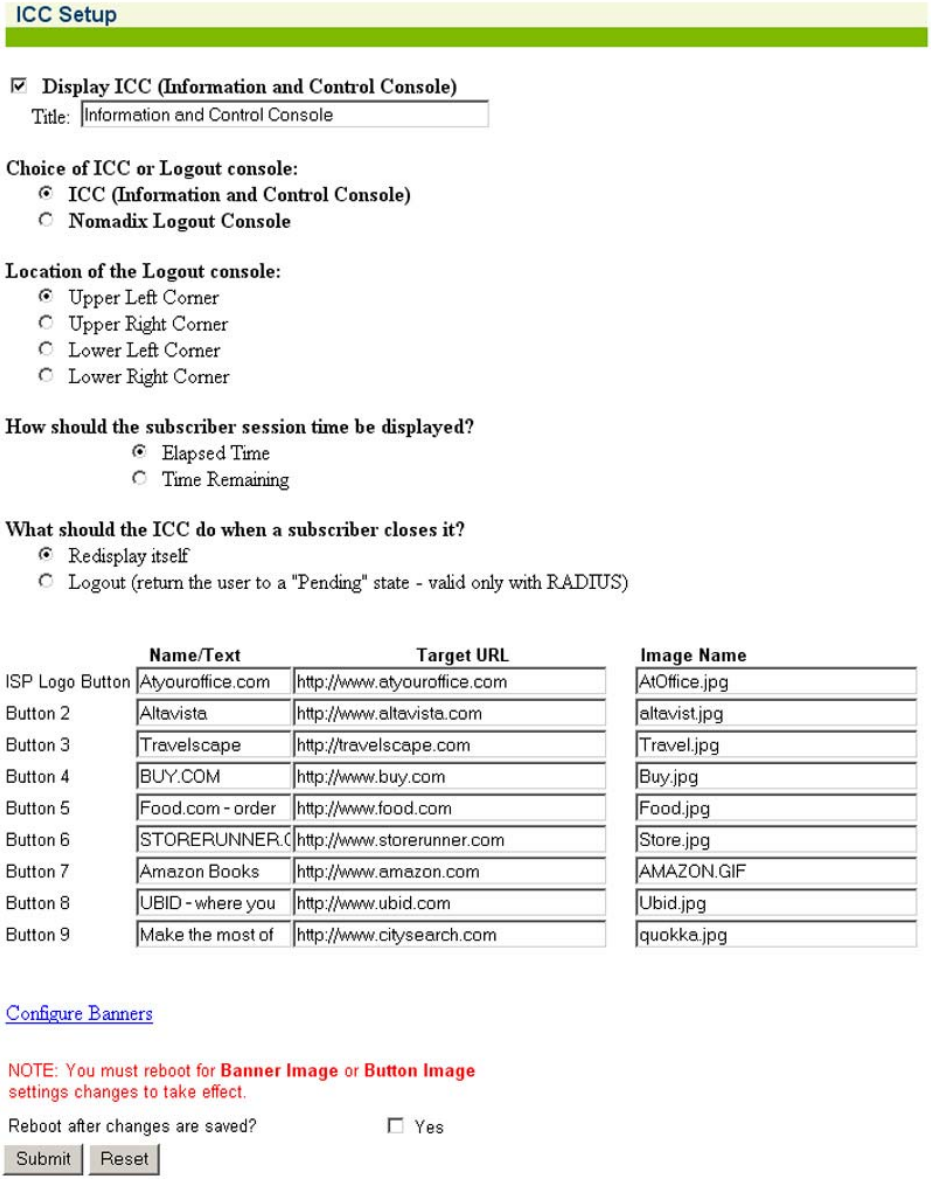
The Access Gateway also lets System Administrators define a simple HTML-based pop-up window for explicit Logout that can be used as an alternative to the more fully featured ICC

(described above). The pop-up Logout Console offers the opportunity to display the elapsed/ count-down time and one logo for intra-session service branding.



This procedure allows you to set up how the ICC is displayed to subscribers. For more information about the ICC, go to "Information and Control Console (ICC)" on page 280.

1. From the Web Management Interface, click on **Subscriber Interface**, then **ICC Setup**. The *ICC Setup* screen appears:


ICC Setup
Display ICC (Information and Control Console)
Title: Information and Control Console
Choice of ICC or Logout console:
ICC (Information and Control Console)
Nomadix Logout Console
Location of the Logout console:
Upper Left Corner
Upper Right Corner
Lower Left Corner
Lower Right Corner
How should the subscriber session time be displayed?
Elapsed Time
Time Remaining
What should the ICC do when a subscriber closes it?
Redisplay itself
Logout (return the user to a "Pending" state - valid only with RADIUS)
Name/Text
Target URL
Image Name
ISP Logo Button Atyouroffice.com http://www.atyouroffice.com AtOffice.jpg
Button 2 Altavista http://www.altavista.com altavist.jpg
Button 3 Travelscape http://travelscape.com Travel.jpg
Button 4 BUY.COM http://www.buy.com Buy.jpg
Button 5 Food.com - order http://www.food.com Food.jpg
Button 6 STORERUNNER.C http://www.storerunner.com Store.jpg
Button 7 Amazon Books http://www.amazon.com AMAZON.GIF
Button 8 UBID - where you http://www.ubid.com Ubid.jpg
Button 9 Make the most of http://www.citysearch.com quokka.jpg
Configure Banners
NOTE: You must reboot for Banner Image or Button Image settings changes to take effect.
Reboot after changes are saved?
Yes
Submit
Reset

2. If you want subscribers to see the ICC (pop-up window), click on the check box for **Display ICC (Information and Control Console)** to enable this feature.
3. Choose which ICC you want to be displayed (either the featured ICC or the simple Logout Console). Enable one of the following:
   - ICC (Information and Control Console)
   - Nomadix Logout Console
4. If you enabled either of the ICC pop-up options, you can choose a unique name for the console. Simply type a meaningful name in the **Title** field.
5. Define the physical location where you want the Nomadix Logout Console to appear on the subscriber's screen.

   Choose one of the following options:
   - Upper Left Corner
   - Upper Right Corner
   - Lower Left Corner
   - Lower Right Corner
6. Define how you want to display the subscriber session time:
   - Elapsed Time (how much time has elapsed since the start of the session)
   - Time Remaining (how much time is remaining for the session)
7. You must now decide what you want the ICC to do if the subscriber closes it.

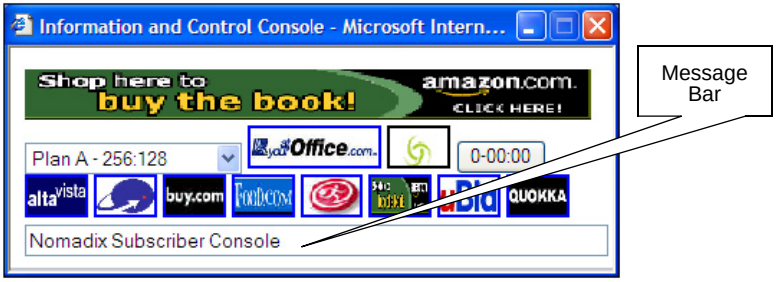
   Choose one of the following options:
   - Redisplay itself
   - Logout (return the subscriber to a "pending" state) – valid only with RADIUS and Post Paid PMS.

   You must now assign the buttons that you want to display to subscribers.

Assigning Buttons

When assigning the redirect buttons that will appear in the ICC, you can define one **ISP Logo Button** (large button) and up to 8 smaller buttons (**Button 2** through **Button 9**), with the following parameters:

- **Name/Text** – The name of the button and the mouse-over text. The mouse-over text is the text that appears in the ICC's Message Bar when your mouse pointer "rolls" over a button image.



- **Target URL** – Where subscribers are sent when they click on the button.
- **Image Name** – The representative image file you want to use for the button.

When assigning images for buttons, refer to: "Pixel Sizes" on page 230.

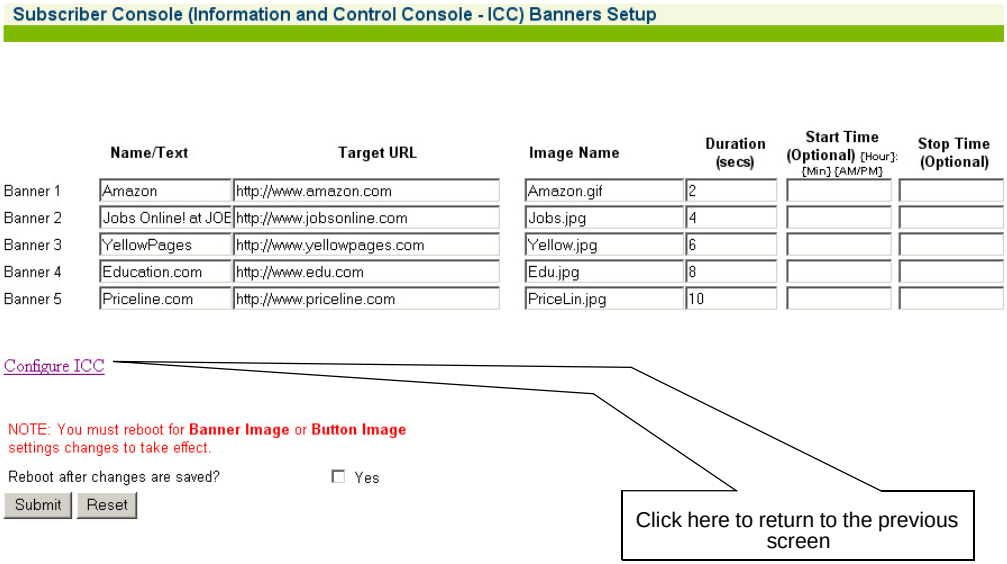
If you assign (or change) button images or banner images, the Access Gateway must be rebooted for your changes to take effect.

When you have completed assigning all your redirect buttons, click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset all the values to their previous state.

You can now assign the banners that you want to display to subscribers.

Assigning Banners

1. From the *Subscriber Console (Information and Control Console - ICC) Setup* screen, click on the **Configure Banners** link. The *Subscriber Console (Information and Control Console - ICC) Banners Setup* screen appears:


Subscriber Console (Information and Control Console - ICC) Banners Setup
Name/Text
Target URL
Image Name
Duration (secs)
Start Time (Optional) {Hour}: {Min} {AM/PM}
Stop Time (Optional)
Banner 1 Amazon http://www.amazon.com Amazon.gif 2
Banner 2 Jobs Online! at JOE http://www.jobsonline.com Jobs.jpg 4
Banner 3 YellowPages http://www.yellowpages.com Yellow.jpg 6
Banner 4 Education.com http://www.edu.com Edu.jpg 8
Banner 5 Priceline.com http://www.priceline.com PriceLin.jpg 10
Configure ICC
NOTE: You must reboot for Banner Image or Button Image settings changes to take effect.
Reboot after changes are saved?
Yes
Submit
Reset
Click here to return to the previous screen

- You can display up to 5 banners, but they must be defined here. Banners require all the same parameters that "buttons" use (see "Assigning Buttons" on page 227), with the addition of 3 (three) more. These are:
- Duration – Defines how long the banner is displayed in the ICC.
- Start Time – This is an optional parameter that you set if you want to assign a "start" time (for when the banner is displayed).
- Stop Time – This is an optional parameter that you set if you want to assign a "stop" time (for when the displayed banner closes).

When assigning images and times for banners, refer to: "Pixel Sizes" on page 230 and "Time Formats" on page 231.

2. Define the parameters for your banner(s):
   - Name/Text
   - Target URL
   - Image Name (see following note)
   - Duration (secs)
   - Start Time (Optional)
   - Stop Time (Optional)

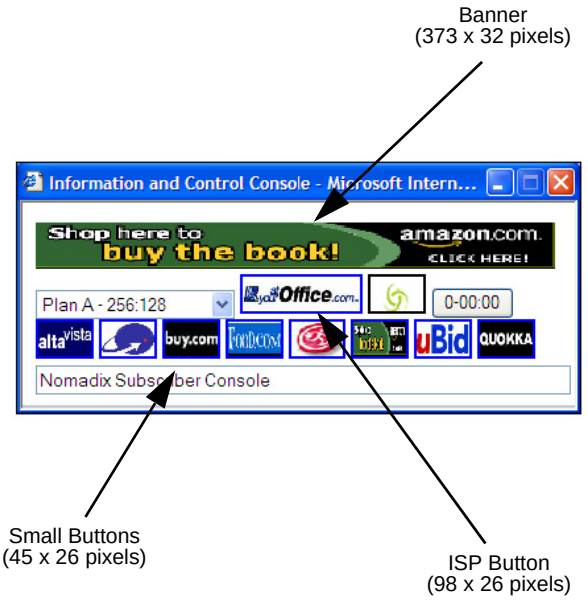
   If you assign (or change) button images or banner images, the Access Gateway must be rebooted for your changes to take effect.

3. If you changed any of the *Image Name* definitions, click on the check box for **Reboot after changes are saved?** (to reboot the Access Gateway).
4. When finished, click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset all the values to their previous state.
5. To return to the previous screen, click on the **Configure ICC** link.

Pixel Sizes

Use the following parameters when defining images for buttons and banners:

- Banners – 373 pixels (width) x 32 pixels (height)
- ISP Button – 98 pixels (width) x 26 pixels (height)
- Small buttons – 45 pixels (width) x 26 pixels (height)



Time Formats

Use the following formats when defining times:

- Duration for Banners – 1 through 9999, or more
- Start or Stop times for Banners – hh:mm PM/AM (for example, 2:35 PM)

Defining Languages {Language Support}

The Access Gateway allows you to define the text displayed to your users by the Internal Web Server (IWS) without any HTML or ASP knowledge. The language you select here will determine the language encoding that the Access Gateway's Internal Web Server instructs the browser to use.

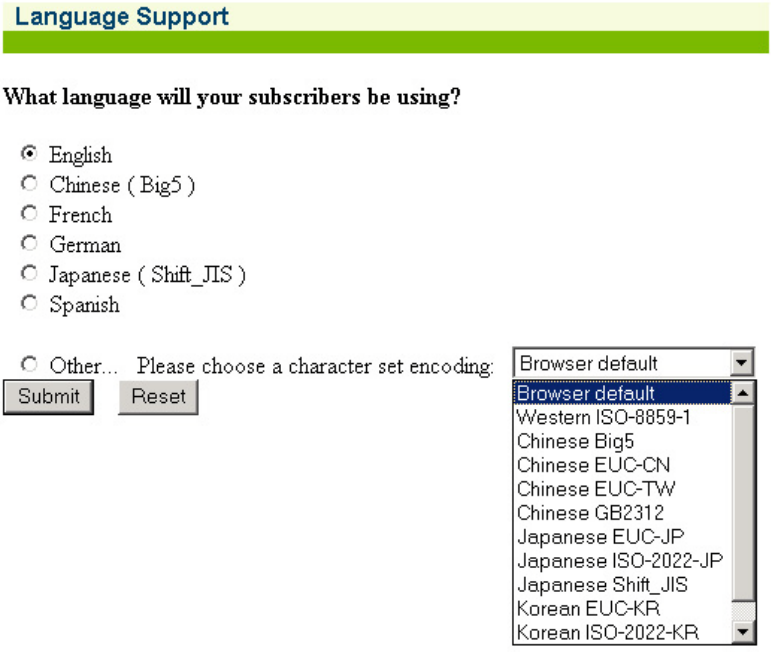
The available language options are:

- English
- Chinese (Big 5)
- French
- German

- Japanese (Shift_JIS)
- Spanish
- Other, with drop-down menu (see note)

You can also change the language of the Web Management Interface. See "Selecting the language of the Web Management Interface" on page 78.

1. From the Web Management Interface, click on **Subscriber Interface**, then **Language Support**. The *Language Support* screen appears:

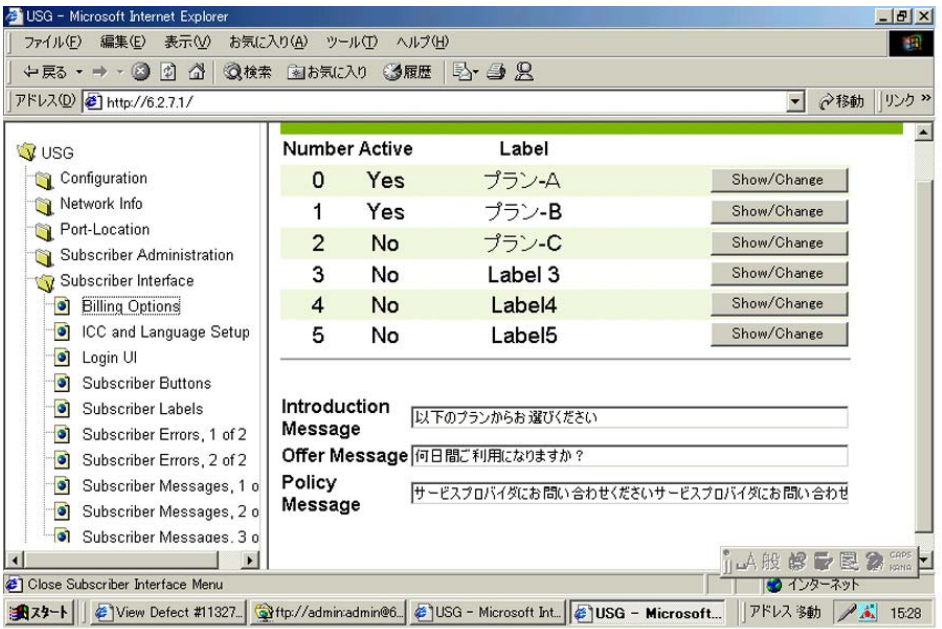


2. Select the language you want to use (see notes).

*There are currently 6 (six) "pre-translated" language options. If you want to have the ICC pre-translated into Japanese and enter and display Japanese characters on the Web Management Interface and the subscriber's portal page, choose the **Japanese (Shift_JIS)** option. If you want to have the ICC displayed in English but enter and display Japanese characters on the Web Management Interface and the subscriber's portal page, choose the **Other** option, then choose one of the available Japanese character sets from the drop-down menu.*

If sufficient space is available, the Access Gateway's Internal Web Server also supports multiple languages at the same time.

The following sample image shows the Web Management Interface (WMI) displayed with Asian language characters.

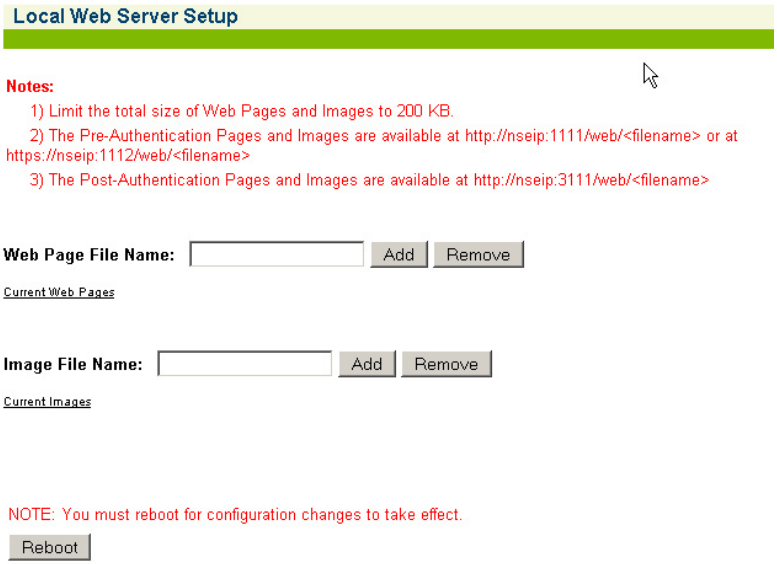


Enable Serving of Local Web Pages {Local Web Server}

Here are the quick setup instructions to enable serving of local web pages.

1. Upload the required pages and images to the /flash/web directory using FTP. Total file size of all pages and images cannot exceed 200 KB. File names should be labeled using the 8.3 format.
2. Go to WMI>Subscriber Interface>Local Web Server and add the names of the HTML or image files that were uploaded to the /flash/web directory.
3. Reboot the NSE (System>Reboot).
4. The pages can now be served by referencing the URL http://nseip:1111/web/<filename> or at https://nseip:1112/web/<filename> for preauthenticated end users.
5. The post-authentication pages and images are available at http://nseip:3111/web/<filename>

These settings are available under Subscriber Interface/Local Web Server menu.


Local Web Server Setup
Notes:
1) Limit the total size of Web Pages and Images to 200 KB.
2) The Pre-Authentication Pages and Images are available at http://nseip:1111/web/<filename> or at https://nseip:1112/web/<filename>
3) The Post-Authentication Pages and Images are available at http://nseip:3111/web/<filename>
Web Page File Name:
Add
Remove
Current Web Pages
Image File Name:
Add
Remove
Current Images
NOTE: You must reboot for configuration changes to take effect.
Reboot

Web Page File Name

This text box lets you add or remove the names of the web pages that you intend to serve to the end users. Note: The name of the web page has to be added in order for it to be served to the end users. Uploading the web page to the /web directory is not sufficient.

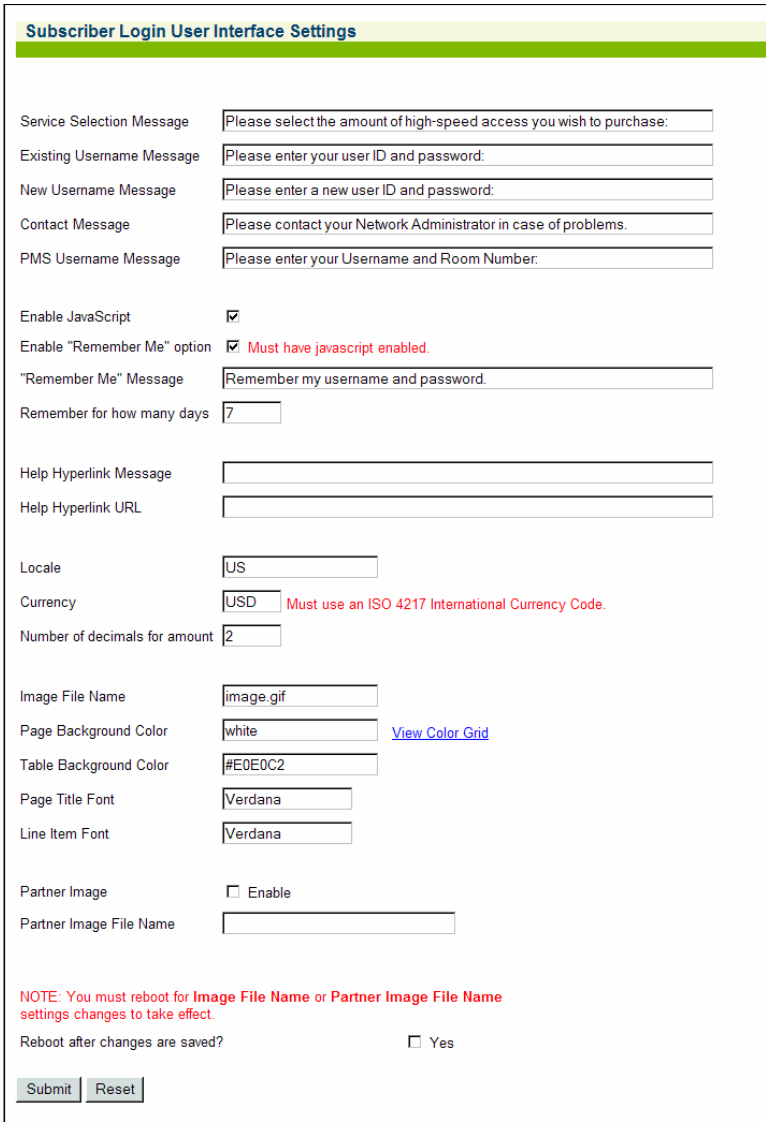
Image File Name

This text box lets you add or remove the names of the image files that you intend to server to the end users. Note: The name of the image file has to be added in order for it to be served to the end users. Uploading the image file to the /web directory is not sufficient.

Defining the Subscriber's Login UI {Login UI}

This procedure allows you to set up the presentation and content of the subscriber's login User Interface (UI).

1. From the Web Management Interface, click on **Subscriber Interface**, then **Login UI**. The *Subscriber Login User Interface Settings* screen appears:



2. Define the messages you want subscribers to see when they log in. Keep messages brief and to the point. Available message categories include:
   - Service Selection Message

- Existing Username Message
- New Username Message
- Contact Message
- PMS Username Message

3. If any of your devices do not support Java™ scripts, you have the option of disabling the Access Gateway's JavaScript™ support (JavaScript support is enabled by default). If necessary (and if JavaScript support is already enabled), click on the check box for **Enable Javascript** to disable this feature.
4. Click on the check box for **Enable "Remember Me" option** if you want to enable (or disable) this feature. This option enables the Access Gateway to "remember" logins for a predetermined duration (see next step).

The "Remember Me" option requires JavaScript to be enabled.

5. If you enabled the "Remember Me" option, define the duration (in days) in the **Remember for how many days** field.
6. If required, define a **Help Hyperlink Message** and a corresponding **Help Hyperlink URL**.
7. Define the location in the **Locale** field.
8. Define the currency labeling (for example, $) in the **Currency** field.

The currency must be defined using an IS0 4217 currency code (for example, USD for US Dollars, GBP for Great British Pounds).

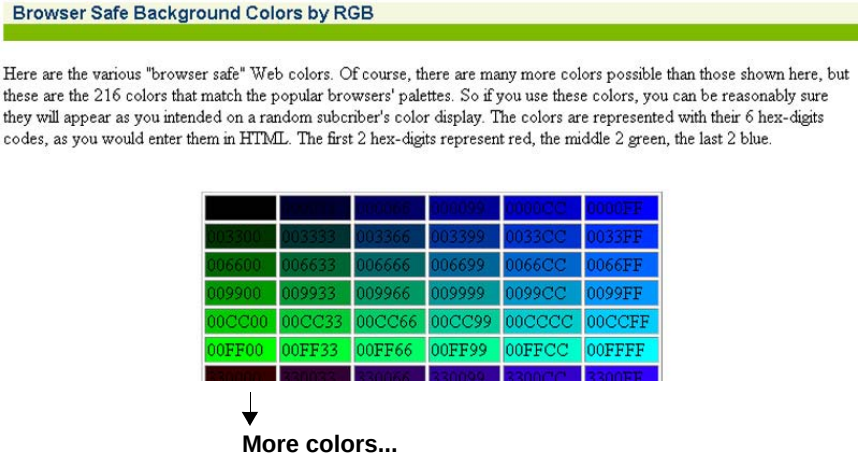
9. Enter a numeric value for the **Number of decimals for amount**. This field defines the number of decimal places that are shown for the displayed amounts.
10. Define the appearance of the internal login screen. Appearance settings include:
    - Image File Name (if you want to include a unique image)
    - Page Background Color
    - Table Background Color
    - Page Title Font
    - Line Item Font

Take care when mixing font and background colors. You may want to experiment before establishing these settings to ensure that your chosen color scheme is both presentable and readable to subscribers (see notes).

You must reboot the Access Gateway for the "Image File Name" or "Partner Image File Name" settings to take effect.

You can view a grid of acceptable screen colors. To view the grid, simply click on the "View Color Grid" link.

If you click on the "View Color Grid" link, the *Browser Safe Background Colors by RGB* screen appears (partial view only shown here):


Browser Safe Background Colors by RGB
Here are the various "browser safe" Web colors. Of course, there are many more colors possible than those shown here, but these are the 216 colors that match the popular browsers' palettes. So if you use these colors, you can be reasonably sure they will appear as you intended on a random subcriber's color display. The colors are represented with their 6 hex-digits codes, as you would enter them in HTML. The first 2 hex-digits represent red, the middle 2 green, the last 2 blue.
003300 003333 003366 003399 0033CC 0033FF
006600 006633 006666 006699 0066CC 0066FF
009900 009933 009966 009999 0099CC 0099FF
00CC00 00CC33 00CC66 00CC99 00CCCC 00CCFF
00FF00 00FF33 00FF66 00FF99 00FFCC 00FFFF
More colors...

11. Click on the check box for **Partner Image** to enable this feature, then enter the name of the image file in the **Partner Image File Name** field. See "Subscriber Login Screen (Sample)" on page 239.
12. If you made changes to the **Image File Name** or **Partner Image File Name** fields, you must reboot the Access Gateway for your changes to take effect. In this case, click on the check box for **Reboot after changes are saved?**.

    The partner image (splash screen) is not the same screen that is defined by the Image File Name (IWS screen) field.

13. Click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset all the values to their previous state.

Subscriber Login Screen (Sample)

The following sample shows a subscriber login screen:

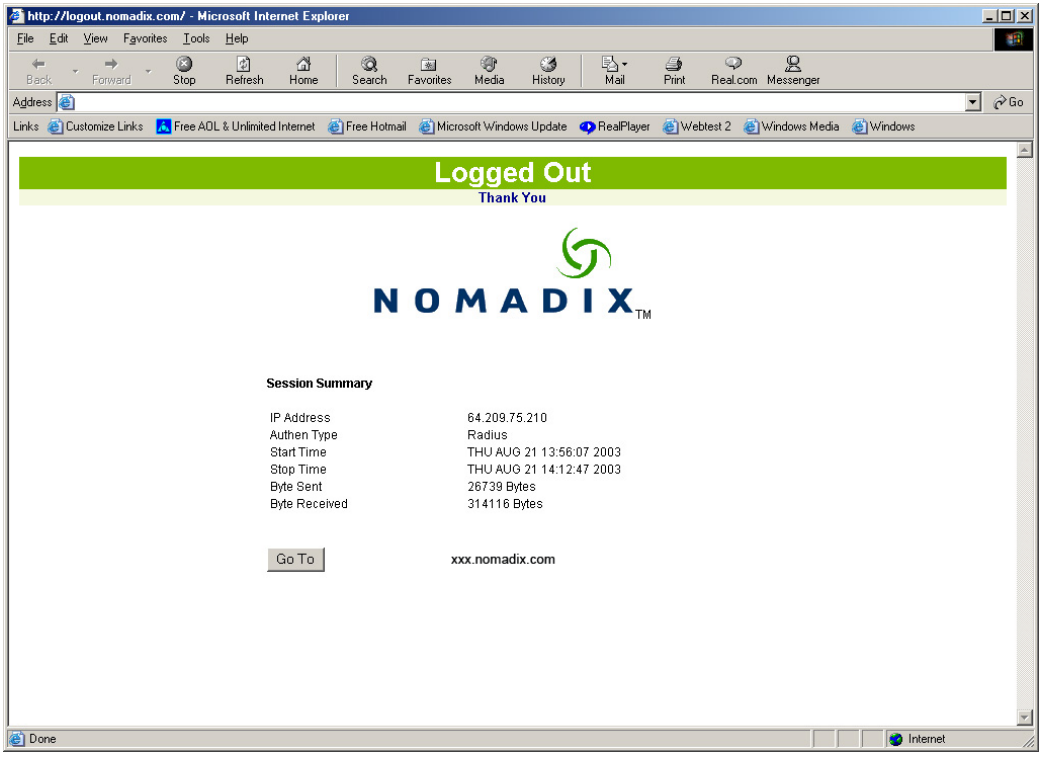
NOMADIX TM
Are you a new user?
New Individual
You an existing user?
Please enter your login name
name:
Pass:
Do you want the browser to store your current password
log
Please contact network administrator for help.
Click here if you need some help.

Defining the Post Session User Interface (Post Session UI)

The Post Session UI (Goodbye Page) can be defined either as a RADIUS VSA or be driven by the Access Gateway's Internal Web Server (IWS). Using the IWS option means that this functionality is available for other post-paid billing mechanisms (for example, post-paid PMS—if your product license supports PMS). The IWS page displays the details of the user's connection, such as:

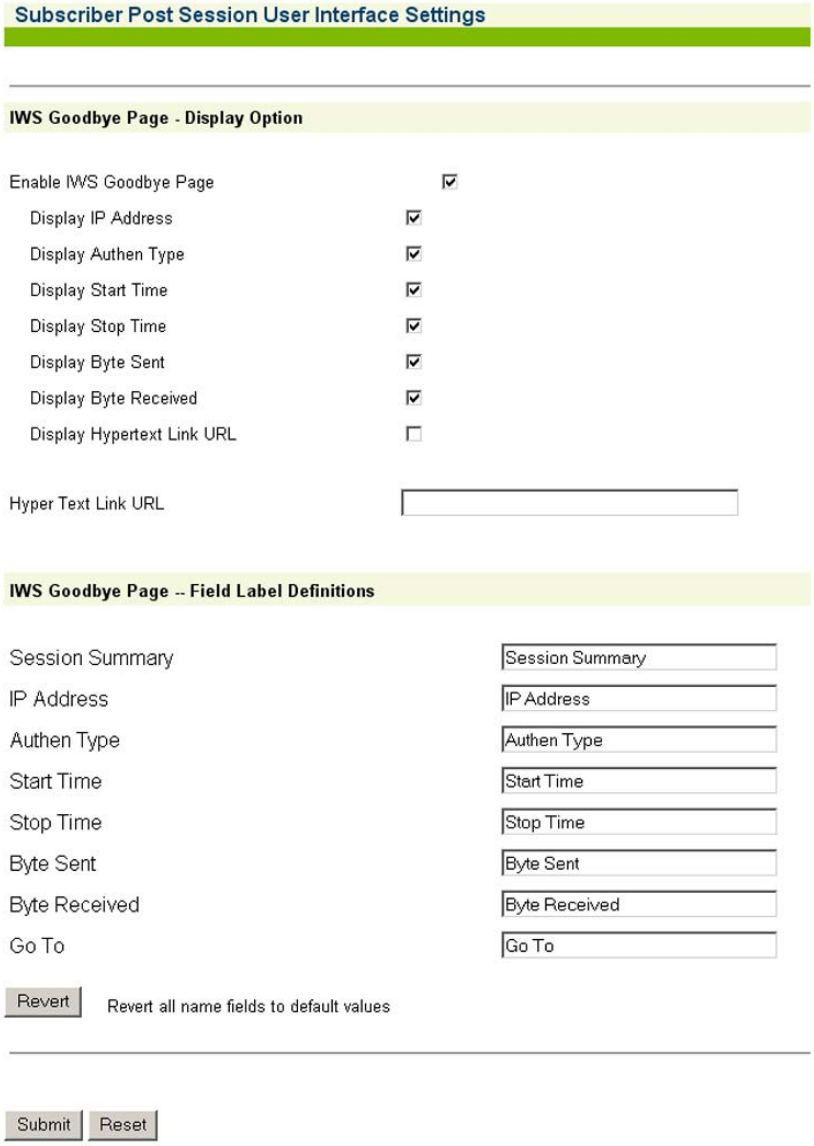
- IP address of the user.
- Type of AAA.
- Start/Stop time.
- Bytes sent/received.

- Freely configurable hypertext link (in case the ISP wants to link the user back to a sign-up/help page).


http://logout.nomadix.com/ - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites Media History Mail Print Real.com Messenger
Address
Go
Links Customize Links Free AOL & Unlimited Internet Free Hotmail Microsoft Windows Update RealPlayer Webtest 2 Windows Media Windows
Logged Out
Thank You
NOMADIX™
Session Summary
IP Address 64.209.75.210
Authen Type Radius
Start Time THU AUG 21 13:56:07 2003
Stop Time THU AUG 21 14:12:47 2003
Byte Sent 26739 Bytes
Byte Received 314116 Bytes
Go To
xxx.nomadix.com
Done
Internet

Sample of Post Session UI (Goodbye Page)

1. From the Web Management Interface, click on **Subscriber Interface**, then **Post Session UI**. The *Subscriber Post Session User Interface Settings* screen appears:



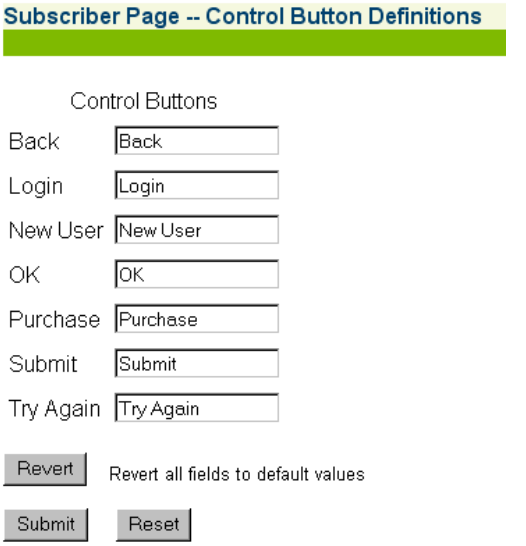
2. Click on the **Enable IWS Goodbye Page** check box to enable (or disable) the IWS Goodbye Page, as required.
3. If you enabled the *IWS Goodbye Page*, select your preferred display options by checking the corresponding boxes:
   - Display IP Address
   - Display Authen Type
   - Display Start Time
   - Display Stop Time
   - Display Byte Sent
   - Display Byte Received
   - Display Hypertext Link URL
4. If you enabled the Hypertext Link URL feature, enter the URL for the link in the **Hyper Text Link URL** field.
5. Define the following *Field Label Definitions* for your Goodbye Page:
   - Session Summary
   - IP Address
   - Authen Type
   - Start Time
   - Stop Time
   - Byte Sent
   - Byte Received
   - Go To

   If you enabled the Partner image for the Login UI, you will also see the same image in the IWS Post Session page.
6. Click on the **Submit** button to save your changes. Alternatively, you can click on the **Reset** button to reset all values to their previous state, or click on the **Revert** button to revert all values to their default state.

Defining Subscriber UI Buttons {Subscriber Buttons}

This procedure allows you to define how each of the control buttons are displayed to subscribers.

1. From the Web Management Interface, click on **Subscriber Interface**, then **Subscriber Buttons**. The *Subscriber Page -- Control Button Definitions* screen appears:



See Caution

2. Enter the definitions you want for each control button in the corresponding fields.

Only the Login button should be named "Login." Do not assign this name to any other button.

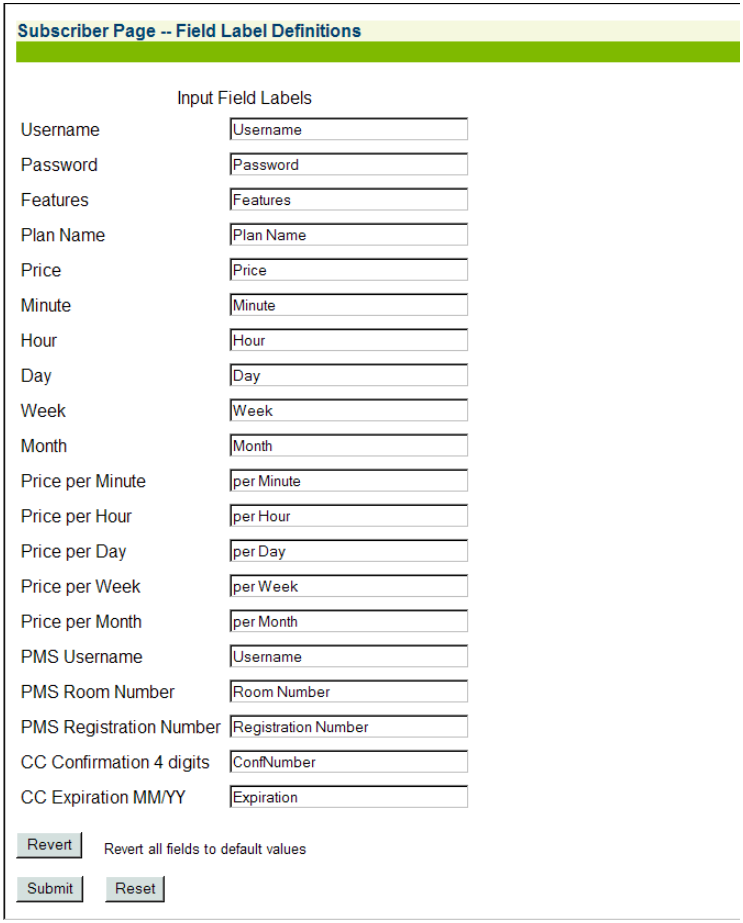
3. Click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset all the values to their previous state.

   If you want to reset all field values to their default state, click on the **Revert** button.

Defining Subscriber UI Labels {Subscriber Labels}

This procedure allows you to define how the user interface (UI) field labels are displayed to subscribers.

1. From the Web Management Interface, click on **Subscriber Interface**, then **Subscriber Labels**. The *Subscriber Page -- Field Label Definitions* screen appears:



2. Enter the definitions you want for each label in the corresponding fields.
3. Click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset all the values to their previous state.

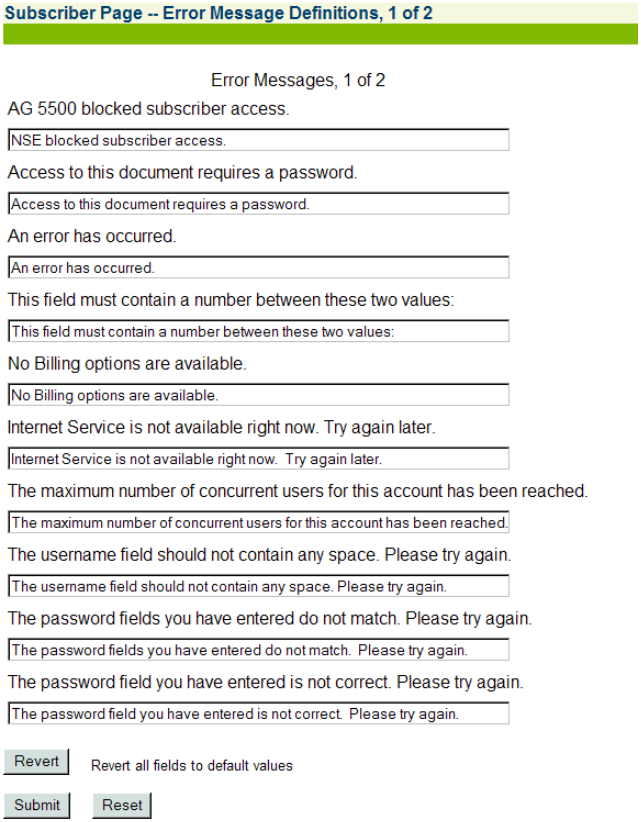
   If you want to reset all field values to their default state, click on the **Revert** button.

Defining Subscriber Error Messages {Subscriber Errors}

This procedure allows you to define how error messages are displayed to subscribers.

There are 2 (two) pages of error messages available.

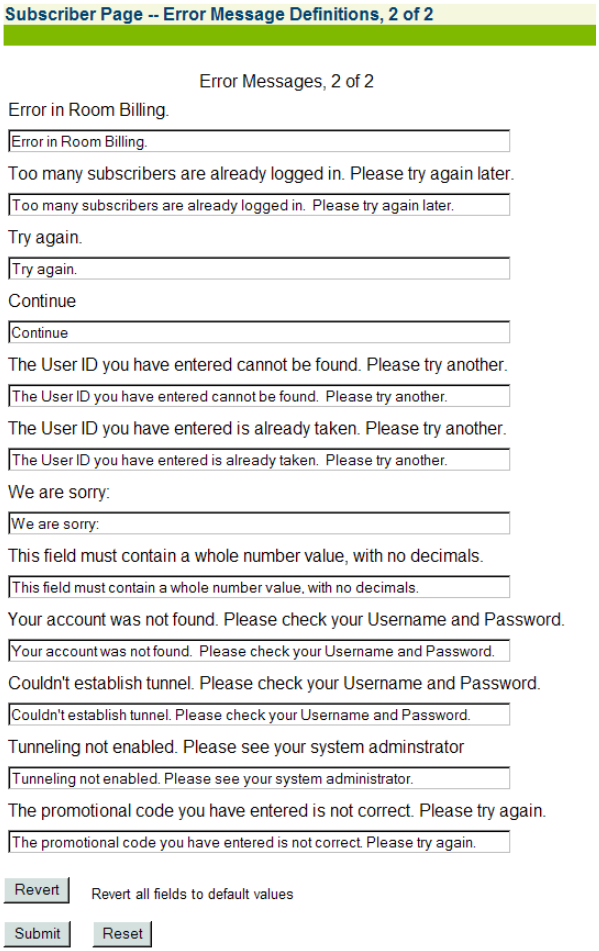
1. From the Web Management Interface, click on **Subscriber Interface**, then **Subscriber Errors, 1 of 2**. The *Subscriber Page -- Error Message Definitions, 1 of 2* screen appears:


Subscriber Page -- Error Message Definitions, 1 of 2
Error Messages, 1 of 2
AG 5500 blocked subscriber access.
NSE blocked subscriber access.
Access to this document requires a password.
Access to this document requires a password.
An error has occurred.
An error has occurred.
This field must contain a number between these two values:
This field must contain a number between these two values:
No Billing options are available.
No Billing options are available.
Internet Service is not available right now. Try again later.
Internet Service is not available right now. Try again later.
The maximum number of concurrent users for this account has been reached.
The maximum number of concurrent users for this account has been reached.
The username field should not contain any space. Please try again.
The username field should not contain any space. Please try again.
The password fields you have entered do not match. Please try again.
The password fields you have entered do not match. Please try again.
The password field you have entered is not correct. Please try again.
The password field you have entered is not correct. Please try again.
Revert
Revert all fields to default values
Submit
Reset

2. Enter the definitions you want for each error message in the corresponding fields.
3. Click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset all the values to their previous state.

If you want to reset all field values to their default state, click on the **Revert** button.

4. Repeat Steps 1 – 3 for page 2 of 2 (see following screen):

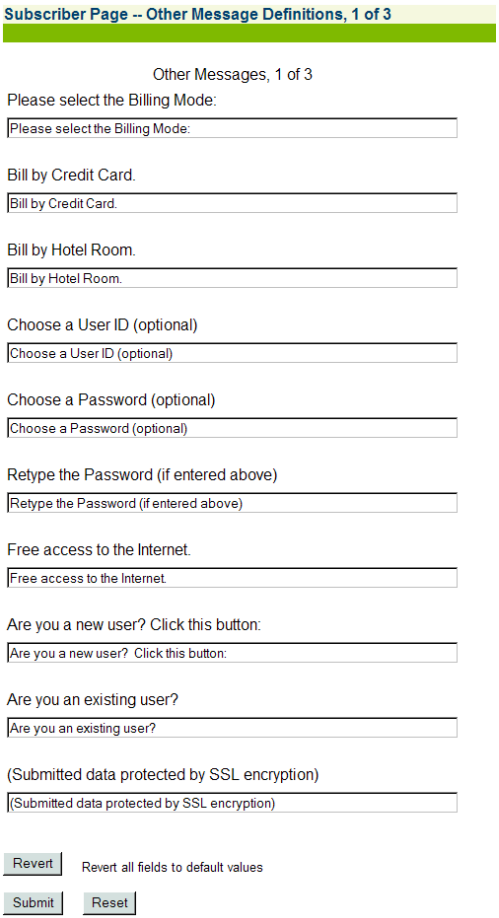

Subscriber Page -- Error Message Definitions, 2 of 2
Error Messages, 2 of 2
Error in Room Billing.
Error in Room Billing.
Too many subscribers are already logged in. Please try again later.
Too many subscribers are already logged in. Please try again later.
Try again.
Try again.
Continue
Continue
The User ID you have entered cannot be found. Please try another.
The User ID you have entered cannot be found. Please try another.
The User ID you have entered is already taken. Please try another.
The User ID you have entered is already taken. Please try another.
We are sorry:
We are sorry:
This field must contain a whole number value, with no decimals.
This field must contain a whole number value, with no decimals.
Your account was not found. Please check your Username and Password.
Your account was not found. Please check your Username and Password.
Couldn't establish tunnel. Please check your Username and Password.
Couldn't establish tunnel. Please check your Username and Password.
Tunneling not enabled. Please see your system adminstrator
Tunneling not enabled. Please see your system administrator.
The promotional code you have entered is not correct. Please try again.
The promotional code you have entered is not correct. Please try again.
Revert
Revert all fields to default values
Submit
Reset

Defining Subscriber Messages {Subscriber Messages}

This procedure allows you to define how “other” subscriber messages are displayed.

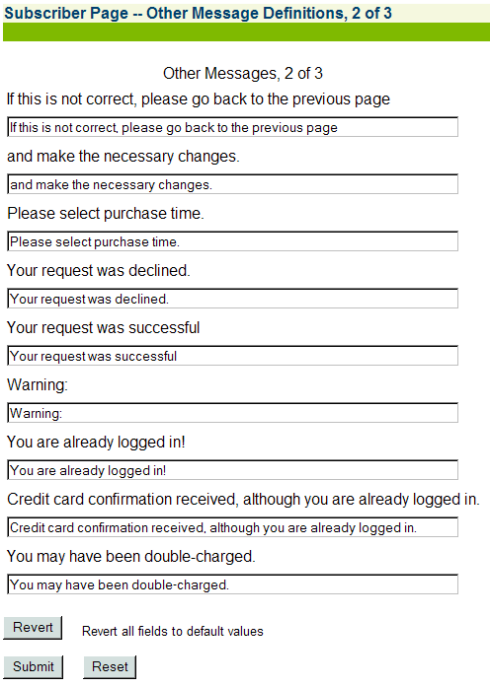
There are 3 (three) pages of subscriber messages available.

1. From the Web Management Interface, click on **Subscriber Interface**, then **Subscriber Messages, 1 of 3**. The *Subscriber Page -- Other Message Definitions, 1 of 3* screen appears:

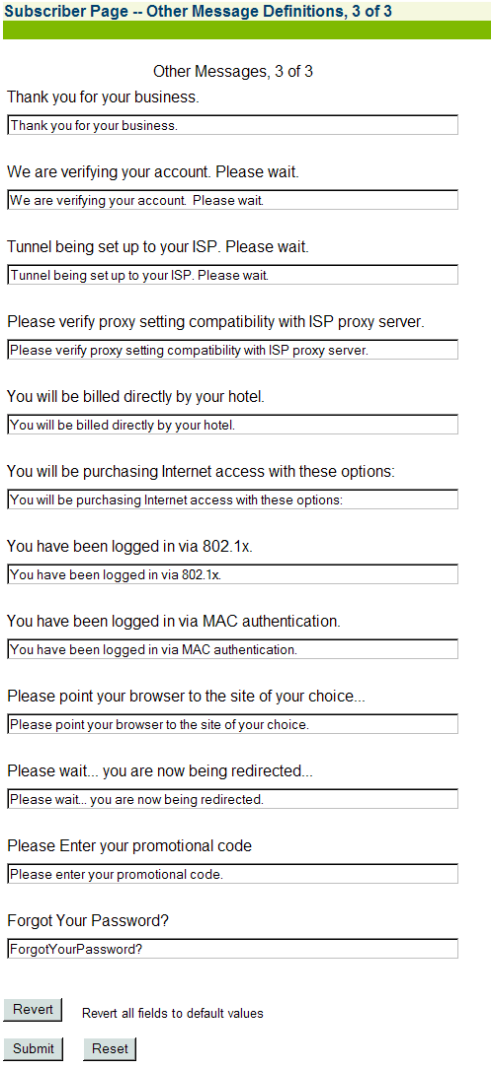

Subscriber Page -- Other Message Definitions, 1 of 3
Other Messages, 1 of 3
Please select the Billing Mode:
Please select the Billing Mode:
Bill by Credit Card.
Bill by Credit Card.
Bill by Hotel Room.
Bill by Hotel Room.
Choose a User ID (optional)
Choose a User ID (optional)
Choose a Password (optional)
Choose a Password (optional)
Retype the Password (if entered above)
Retype the Password (if entered above)
Free access to the Internet.
Free access to the Internet.
Are you a new user? Click this button:
Are you a new user? Click this button:
Are you an existing user?
Are you an existing user?
(Submitted data protected by SSL encryption)
(Submitted data protected by SSL encryption)
Revert
Revert all fields to default values
Submit
Reset

2. Enter the definitions you want for each subscriber message in the corresponding fields.
3. Click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset all the values to their previous state.

   If you want to reset all field values to their default state, click on the **Revert** button.
4. Repeat Steps 1 – 3 for page 2 of 3 (see following screen):


Subscriber Page -- Other Message Definitions, 2 of 3
Other Messages, 2 of 3
If this is not correct, please go back to the previous page
If this is not correct, please go back to the previous page
and make the necessary changes.
and make the necessary changes.
Please select purchase time.
Please select purchase time.
Your request was declined.
Your request was declined.
Your request was successful
Your request was successful
Warning:
Warning:
You are already logged in!
You are already logged in!
Credit card confirmation received, although you are already logged in.
Credit card confirmation received, although you are already logged in.
You may have been double-charged.
You may have been double-charged.
Revert
Revert all fields to default values
Submit
Reset

5. Repeat Steps 1 – 3 for page 3 of 3 (see following screen):

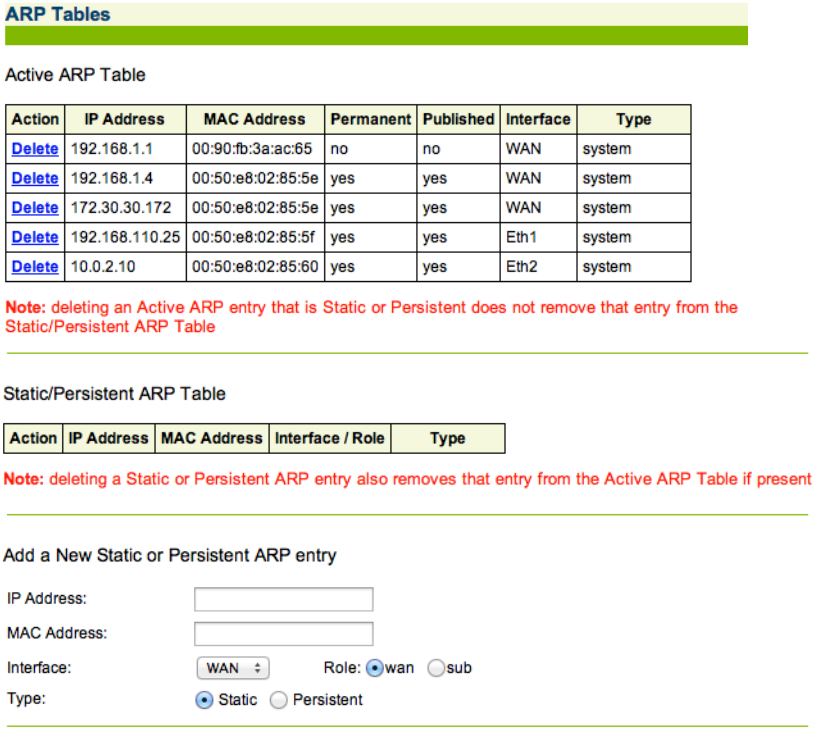

Subscriber Page -- Other Message Definitions, 3 of 3
Other Messages, 3 of 3
Thank you for your business.
Thank you for your business.
We are verifying your account. Please wait.
We are verifying your account. Please wait.
Tunnel being set up to your ISP. Please wait.
Tunnel being set up to your ISP. Please wait.
Please verify proxy setting compatibility with ISP proxy server.
Please verify proxy setting compatibility with ISP proxy server.
You will be billed directly by your hotel.
You will be billed directly by your hotel.
You will be purchasing Internet access with these options:
You will be purchasing Internet access with these options:
You have been logged in via 802.1x.
You have been logged in via 802.1x.
You have been logged in via MAC authentication.
You have been logged in via MAC authentication.
Please point your browser to the site of your choice...
Please point your browser to the site of your choice.
Please wait... you are now being redirected...
Please wait... you are now being redirected.
Please Enter your promotional code
Please enter your promotional code.
Forgot Your Password?
ForgotYourPassword?
Revert
Revert all fields to default values
Submit
Reset

System Menu

Adding and Deleting ARP Table Entries

ARP (Address Resolution Protocol) is used to dynamically bind a high level IP address to a low level physical hardware (MAC) address. ARP is limited to a single physical network that supports hardware broadcasting. This procedure shows you how to add or delete an ARP table entry.

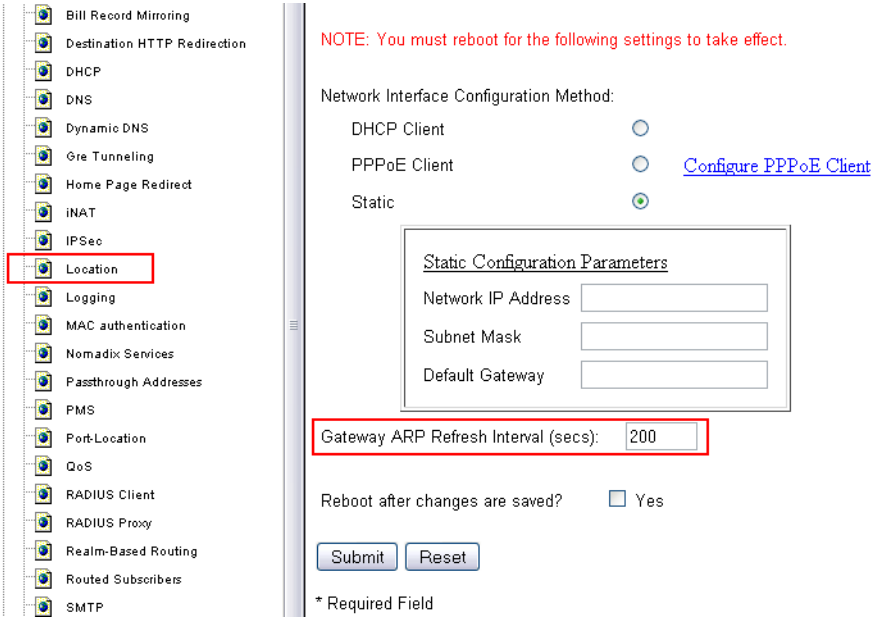
1. From the Web Management Interface, click on **System**, then **ARP**. The *ARP Tables* screen appears. You can view, delete, or add new ARP table entries from this screen.


ARP Tables
Active ARP Table
Action IP Address MAC Address Permanent Published Interface Type
Delete 192.168.1.1 00:90:fb:3a:ac:65 no no WAN system
Delete 192.168.1.4 00:50:e8:02:85:5e yes yes WAN system
Delete 172.30.30.172 00:50:e8:02:85:5e yes yes WAN system
Delete 192.168.110.25 00:50:e8:02:85:5f yes yes Eth1 system
Delete 10.0.2.10 00:50:e8:02:85:60 yes yes Eth2 system
Note: deleting an Active ARP entry that is Static or Persistent does not remove that entry from the Static/Persistent ARP Table
Static/Persistent ARP Table
Action IP Address MAC Address Interface / Role Type
Note: deleting a Static or Persistent ARP entry also removes that entry from the Active ARP Table if present
Add a New Static or Persistent ARP entry
IP Address:
MAC Address:
Interface: WAN Role: wan sub
Type: Static Persistent

Configurable Gateway ARP Refresh Interval

The NSE will periodically refresh its ARP cache entry for the gateway IP. When gateway redundancy is implemented via the use of multiple gateway devices with the same IP address, the periodic refresh enables the NSE to quickly discover the new MAC address of the gateway.

You can set the refresh frequency on the Location page. The frequency must be between 30 and 600 seconds. 600 seconds is half of the ARP cache refresh interval, so the ARP entry can never expire.



Enabling the Bridge Mode Option {Bridge Mode}

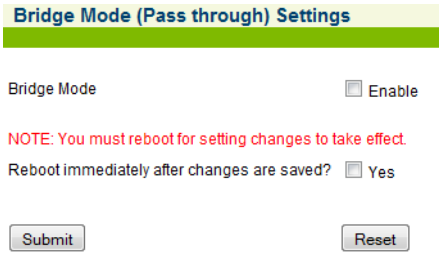
Bridge Mode allows complete and unconditional access to devices on the subscriber side of the Access Gateway. When the *Bridge Mode* option is enabled, the Access Gateway is effectively transparent to the network in which it is located, allowing clusters of switches (especially Cisco Systems switch clusters) to be managed using the STP (Spanning Tree Protocol), or any other algorithm/protocol. The Access Gateway forwards any and all packets (except those addressed to the Access Gateway network interface). The packets are unmodified and can be forwarded in both directions. This is a very useful feature when troubleshooting your entire

network as it allows administrators to effectively “remove” the Access Gateway from the network without physically disconnecting the unit.

You can still manage the Access Gateway when *Bridge Mode* is enabled, but you have no other functionality. If you enable the *Bridge Mode* option and then plug the Access Gateway into a network, all you need to do is assign it routable IP addresses. You can then set up all other features and disable the *Bridge Mode* option whenever you want to start using the Access Gateway in that network.

This procedure shows you how to enable the *Bridge Mode* option.

1. From the Web Management Interface, click on **System**, then **Bridge Mode**. The *Bridge Mode (Passthrough) Settings* screen appears:



2. Click on the check box for **Bridge Mode** to enable this feature.

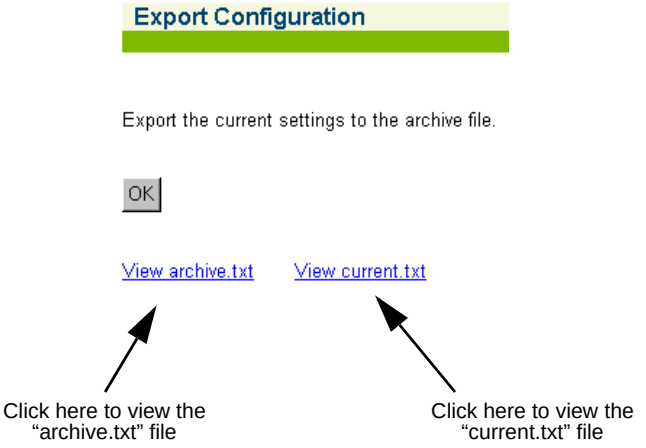
The Access Gateway should be rebooted if this setting is changed.

3. If you want the changes to take effect immediately, Select **Yes** to “Reboot immediately after changes are saved”.
4. Click on the **Submit** button to save your changes, or click on the **Reset** button if you want to reset the “Enable” option to its previous state.

Exporting Configuration Settings to the Archive File {Export}

This procedure shows you how to export the current system authentication settings to an archive file for future retrieval. This function is useful if you want to change the configuration settings and you are unsure of the effect that the changes will have. You can restore the archived system configuration settings at any time with the *import* function.

1. From the Web Management Interface, click on **System**, then **Export**. The *Export Configuration* screen appears:


Export Configuration
Export the current settings to the archive file.
OK
View archive.txt
View current.txt
Click here to view the "archive.txt" file
Click here to view the "current.txt" file

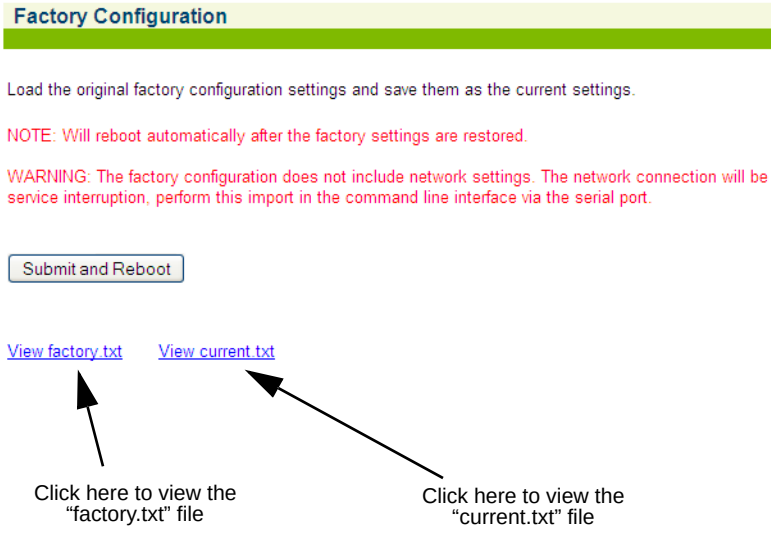
2. Click on the **OK** button to export the current authentication settings to the *archive.txt* file.

Importing the Factory Defaults {Factory}

This procedure shows you how to replace the current authentication settings with the settings that were established at the factory.

You will need to reboot the system for some of the imported default settings to take effect.

1. From the Web Management Interface, click on **System**, then **Factory**. The *Factory Configuration* screen appears:


Factory Configuration
Load the original factory configuration settings and save them as the current settings.
NOTE: Will reboot automatically after the factory settings are restored.
WARNING: The factory configuration does not include network settings. The network connection will be service interruption, perform this import in the command line interface via the serial port.
Submit and Reboot
View factory.txt
View current.txt
Click here to view the "factory.txt" file
Click here to view the "current.txt" file

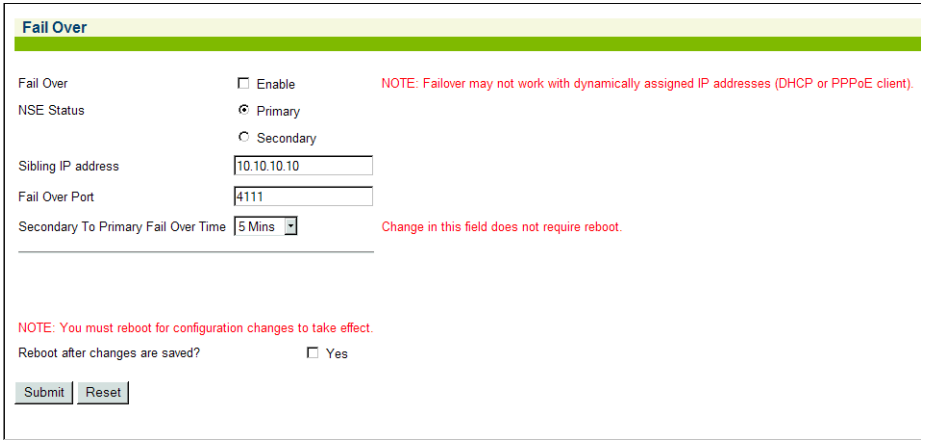
2. Click on the **Submit and Reboot** button to replace the current system configuration settings with the factory default settings and reboot the Access Gateway.

Defining the Fail Over Options {Fail Over}

Your product license may not support this feature.

Many large scale networks require fail-over support for all devices in the public access network. The Fail Over Options feature allows two Nomadix Gateways to act as siblings, where one device will take up the users should the other device become disconnected from the network. As part of this functionality, the settings (except IP addresses) between the two devices will be synchronized automatically.

1. From the Web Management Interface, click on **System**, then **Fail Over**. The *Fail Over* screen appears:



2. Enable or disable the **Fail Over** feature, as required.
3. If you enabled Fail Over, define the **Sibling Status** (Primary or Secondary).
4. Enter an IP address in the **Sibling IP Address** field.
5. Define the port in the **Fail Over Port** field.
6. Select the **Secondary To Primary Fail Over Time**. The time set here is how long the Secondary will wait while not receiving messages from the Primary before it takes over.
7. Click on the check box for **Reboot after changes are saved?**

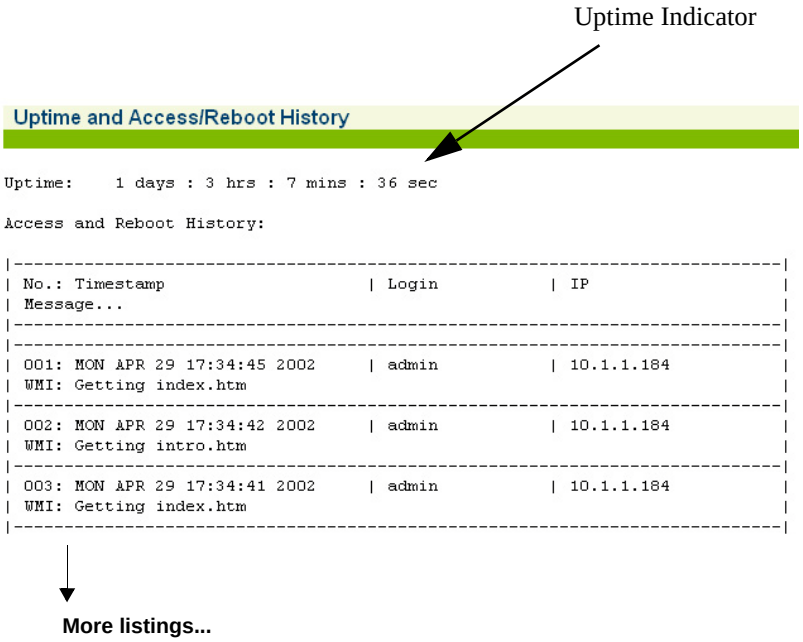
   If you are using RADIUS, it is recommended to add both Nomadix gateways to the RADIUS server.

8. Click on the **Submit** button to save your changes, or click on the **Reset** button to reset all values to their previous state.

Viewing the History Log {History}

You can view a history log of the system's *Access*, *Reboot*, and *Uptime* activities. The history log contains up to 500 entries. Over 500 entries and each new log item removes the oldest entry in the list. The latest entry is always at the top of the list.

To view the history log, go to the Web Management Interface and click on **System**, then **History**. The *Uptime and Access/Reboot History* screen appears:


Uptime Indicator
Uptime and Access/Reboot History
Uptime: 1 days : 3 hrs : 7 mins : 36 sec
Access and Reboot History:
| No.: Timestamp | Login | IP |
| Message... |
| 001: MON APR 29 17:34:45 2002 | admin | 10.1.1.184 |
| WMI: Getting index.htm |
| 002: MON APR 29 17:34:42 2002 | admin | 10.1.1.184 |
| WMI: Getting intro.htm |
| 003: MON APR 29 17:34:41 2002 | admin | 10.1.1.184 |
| WMI: Getting index.htm |
More listings...

The “Uptime” field displays the time (in days, hours, minutes, and seconds) that the system has been up and running.

The “Access and reboot History” log fields include:

- Message – Administrator / Operator action.
- Login – User name of the Administrator / Operator.
- IP – Source IP address (see note).

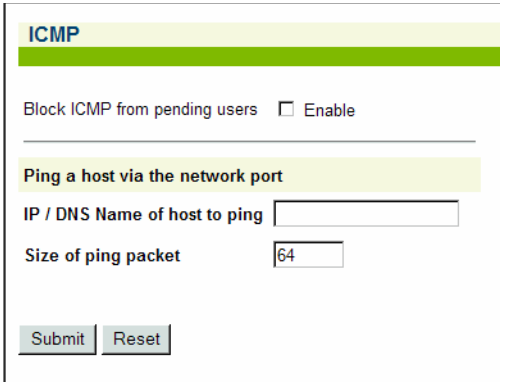
The source IP displayed may be the source IP of a NAT router instead of the client of the person accessing the Access Gateway.

Establishing ICMP Blocking Parameters {ICMP}

The Access Gateway includes the option to block all ICMP traffic from “pending” or “non authenticated” users that are destined to addresses other than those defined in the pass-through

(walled garden) list. The default setting for this option is “disabled” because ICMP pass-through is a useful end-user troubleshooting feature and is also required by certain smart clients (for example, GRIC).

1. From the Web Management Interface, click on **System**, then **ICMP**. The *ICMP* screen appears:



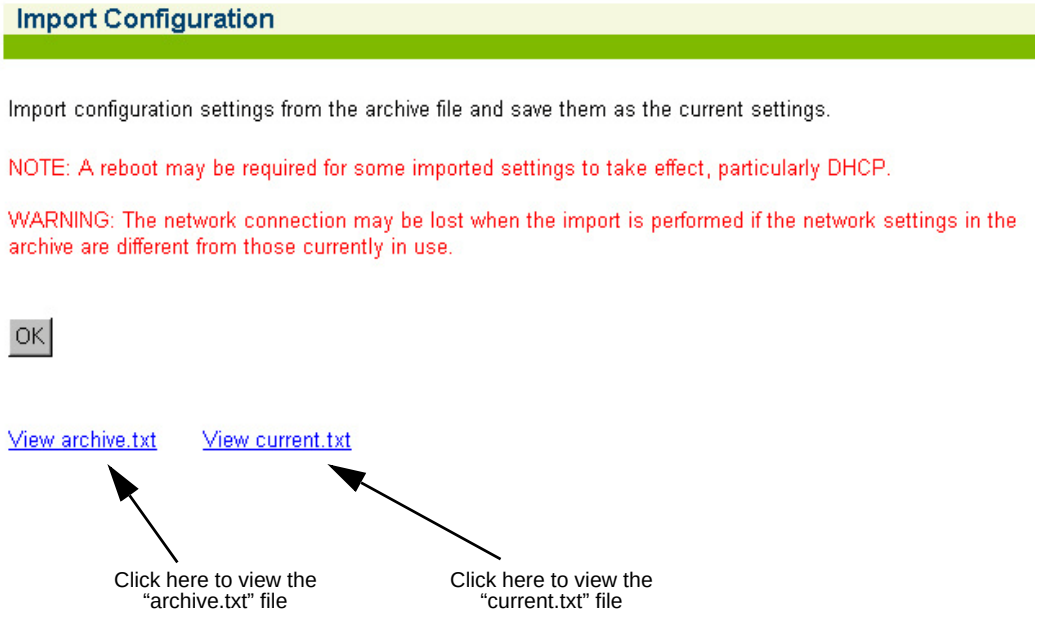
2. Click on the check box for **Block ICMP from pending users** to enable (or disable) this feature, as required.
3. You can **Ping a host via the network port** by entering either an IP address or DNS name of host. This is the site that you want the ping to be sent to from the NSE.
4. Click on the **Submit** button to save your changes, or click on the **Reset** button to reset all values to their previous state.

Importing Configuration Settings from the Archive File {Import}

This procedure shows you how to restore the system configuration settings from an archive file (previously created with the *export* function).

You will need to reboot the system for some of the imported default settings to take effect (especially DHCP).

1. From the Web Management Interface, click on **System**, then **Import**. The *Import Configuration* screen appears:


Import Configuration
Import configuration settings from the archive file and save them as the current settings.
NOTE: A reboot may be required for some imported settings to take effect, particularly DHCP.
WARNING: The network connection may be lost when the import is performed if the network settings in the archive are different from those currently in use.
OK
View archive.txt
View current.txt
Click here to view the "archive.txt" file
Click here to view the "current.txt" file

2. Click on the **OK** button to replace the current system configuration settings with the settings contained in the *archive.txt* file (see notes above).

Establishing Login Access Levels {Login}

This procedure shows you how to assign differentiated access levels for operators and managers at login.

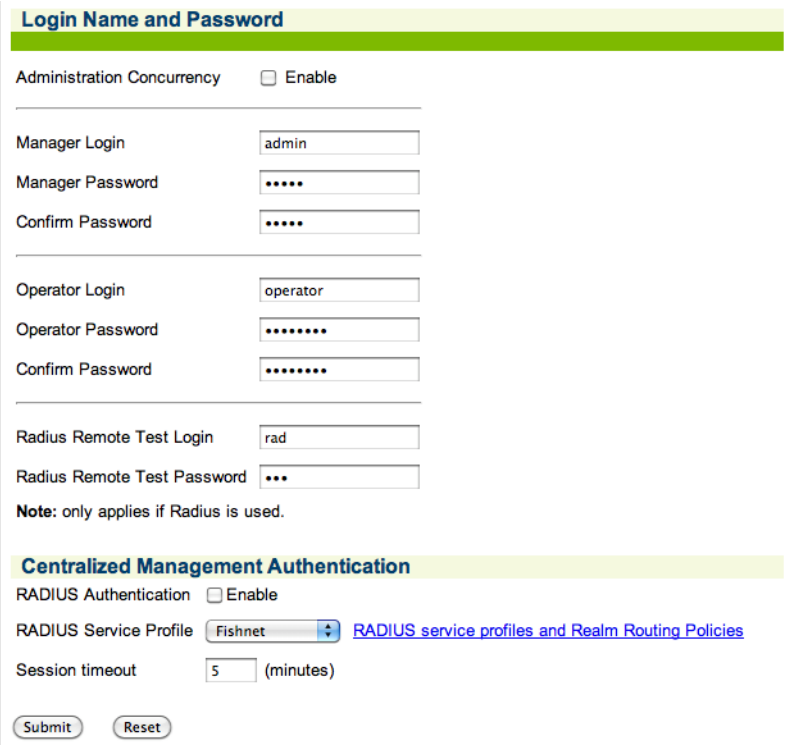
The Access Gateway allows you to define 2 concurrent access levels to differentiate between managers and operators, where managers are permitted *read/write* access and operators are restricted to *read* access only. Once the logins have been assigned, managers have the ability to perform all write commands (*Submit*, *Reset*, *Reboot*, *Add*, *Delete*, etc.), but operators cannot change any system settings. Administrative Concurrency may be enabled to further restrict the amount of management sessions allowed at one time. When this feature is enabled, one manager and three operators can access the Access Gateway at any one time (the default is "disabled").

This feature supports the following interfaces:

- Telnet
- Command Line Interface (CLI) – serial
- Web Management Interface (WMI)
- FTP and SFTP (no operator access allowed)
- SSH Shell Access
- SSL

Only managers can assign a username and password for the remote RADIUS testing login option.

1. From the Web Management Interface, click on **System**, then **Login**. The *Login Name and Password* screen appears:



2. Click on the check box for **Administration Concurrency** if you want to assign concurrent *Manager* and *Operator* logins.

3. In the **Manager Login** field, enter a login name for this manager.

Login names and passwords are case-sensitive. Use login names and passwords that are easy to remember (up to 11 characters, any character type).

4. In the **Manager Password** field, enter a password for this manager.
5. In the **Confirm Password** field, enter the password again to confirm it.

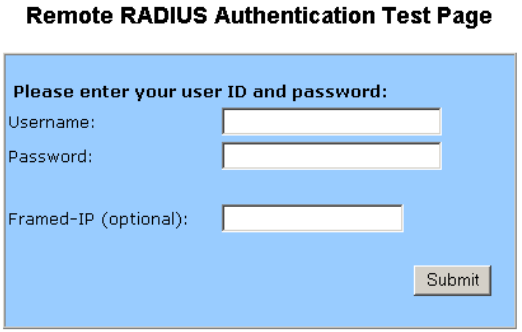
If you forget your password, you will need to contact technical support. See also, "Technical Support" on page 349.

6. If you enabled *Administration Concurrency*, repeat steps 3 to 5 for an operator login.

   As part of its Smart Client feature, the Access Gateway offers a remote RADIUS testing feature (enabled by default). With this feature, the Access Gateway provides a password-protected Web page. From this Web page, technical support can type a username and password and instruct the Access Gateway to send a RADIUS access request to the RADIUS server—following the same basic rules as if the request was from a user. The URL for the test page is **http://<Nomadix Access Gateway IP>/radtest/testradius.htm** and can be accessed from the network side of the Access Gateway. You must open a separate browser to utilize this feature. The "Framed IP" field is configurable by the user and can be set to any IP address.

7. Click on the check box for **Radius Authentication Enable** to enable the Centralized Authentication mechanism. If chosen, the system will first try to authenticate against the local database and then will check against the RADIUS Service Profiles that are configured.
8. Select the RADIUS Service Profile from the pop-up list. The list of available profiles is defined in Realm-Based Routing.
9. Enter a Session Timeout value in minutes. This defines the time of validity period of the cookie passed to the Web browser from the WMI Session and RADIUS session.

10. *Managers Only*: If RADIUS is enabled, you can enter a login name in the **RADIUS Remote Test Login** field.



For RADIUS logins, the maximum number of characters for usernames is 96. The maximum number of characters for passwords is 128.

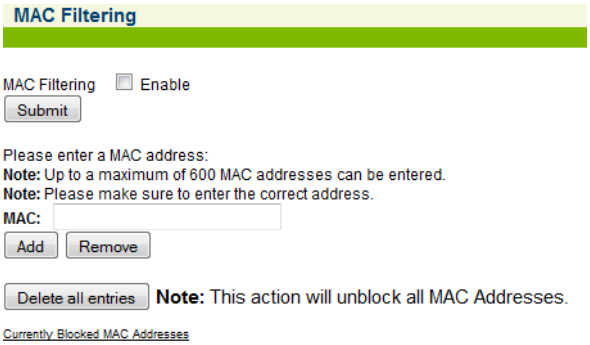
11. *Managers Only*: If you entered a login name in Step 7, enter a password in the **RADIUS Remote Test Password** field.
12. *Managers Only*: Click on the **Submit** button to save the login and password parameters, or click on the **Reset** button if you want to reset all the values to their previous state.

Defining the MAC Filtering Options {MAC Filtering}

MAC Address filtering enhances Nomadix' access control technology by allowing System Administrators to block malicious users based on their MAC address. Up to 600 MAC addresses can be blocked at any one time (see caution).

MAC addresses that you enter here will cause the subscribers at these addresses to be blocked from service. Please make sure that you enter the correct addresses before submitting the data.

1. From the Web Management Interface, click on **System**, then **MAC Filtering**. The *MAC Filtering* screen appears:



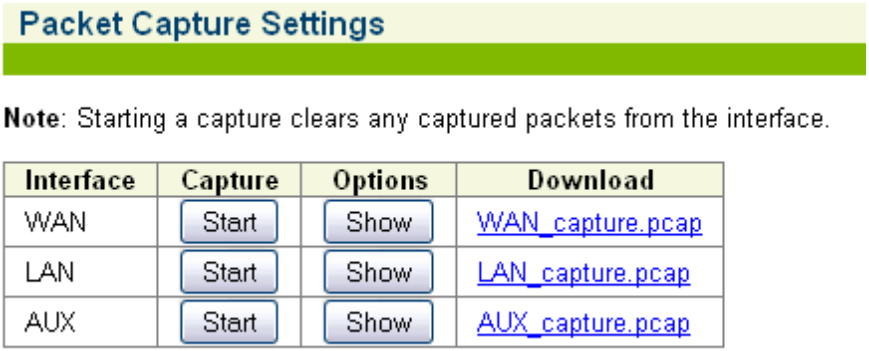
2. Click on the check box for **MAC Filtering** to enable (or disable) this feature, as required.
3. Enter a MAC address in the **MAC** field, then click on the **Add** button to add this address to the "blocked" list, or click on the **Remove** button to remove this address from the list.

For advanced security, see also, "Establishing Session Rate Limiting {Session Limit}" on page 266.

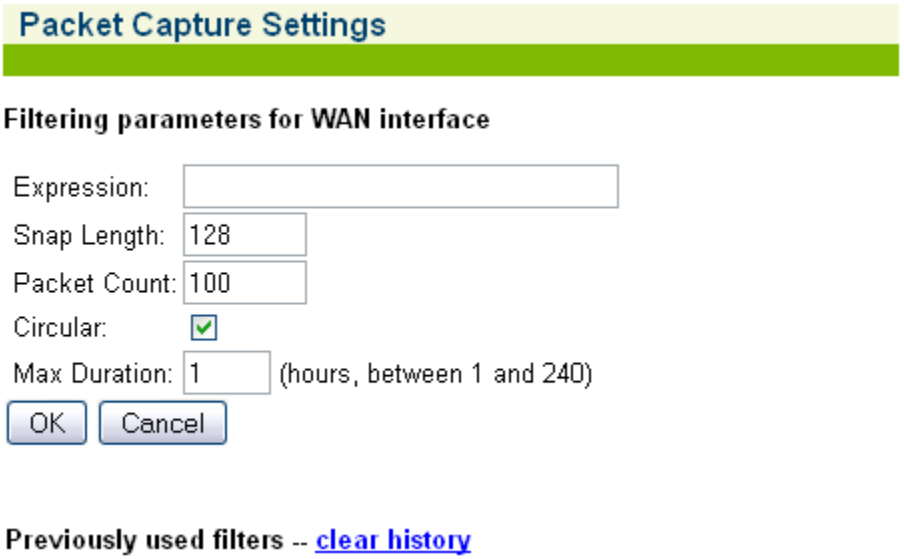
Utilizing Packet Capturing {Packet Capture}

The Packet Capture feature provides NSE administrators with an on-system utility to capture network traffic on each of the NSE network interfaces. The captured network traffic will be accessible for FTP download and viewing on a remote host, in the form of a PCAP-formatted file. (Note that a utility that is capable of reading and displaying PCAP-formatted files, such as Wireshark®, is required in order to view the results).

1. From the Web Management Interface, click on System, then Packet Capture. The Packet Capture Settings screen appears:



2. To initiate a capture on a given interface, click that interface's associated Start button. The button label will change to Stop, indicating that a capture is in progress. Click the button again to stop the capture.
3. When a capture has been stopped, the captured traffic can be viewed by clicking the Download link for the given interface.
4. To modify capture settings, click the Show button for the desired interface. This will display the parameters that can be adjusted. Filtering expressions must be entered in the form of a PCAP-style string:

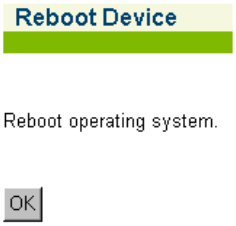


Rebooting the System {Reboot}

This procedure shows you how to reboot the Access Gateway.

The "reboot" procedure outlined on this page allows you to decide when to reboot (if you are making multiple changes to different menu functions and you want to reboot just one time after completing all your changes).

1. From the Web Management Interface, click on **System**, then **Reboot**. The *Reboot Device* screen appears:



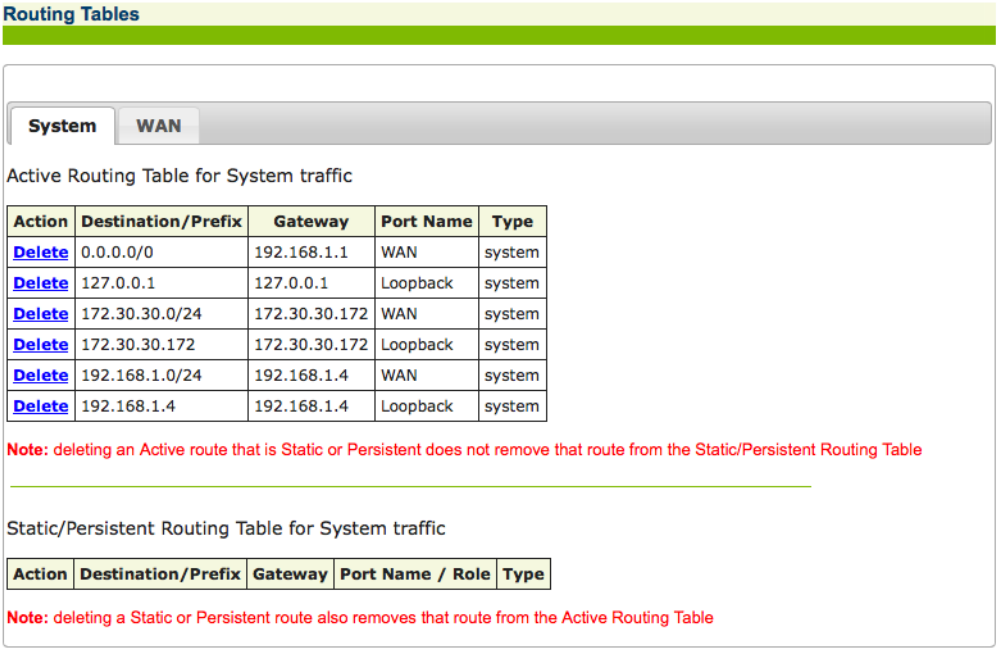
2. Click on **OK** to reboot the operating system.

Routing Tables {Routing}

This command allows you to configure static routes and pick the WAN interface for a specific destination network. The display provides information on network routes and their system connections. You can also add or delete routes from this screen.

To use this feature, WAN Load Balancing must be enabled. See "Load Balancing" on page 127.

To view the routing tables, choose **System** > **Routing**. The **Routing Tables** screen appears.



You can view the routes associated with each physical NSE port by clicking on the tab for the port. In the screen shot above, only the WAN port is in use.

Adding a Route

1. On the Routing Tables screen, scroll to **Add a New Static or Persistent Route**.

2. Enter the **Destination IP/Prefix Length** address of the route you want to add to the routing table. This is the Destination IP or Subnet that the Route is trying to reach, with the prefix length to determine how large the subnet might be.
3. Enter the **Gateway IP** address for the Route being added so that the NSE knows what to use to try to reach the destination IP/Subnet.
4. Choose the **Port Name**, the physical NSE Port to which the route is attached.
5. Choose the **Role** based on what the route is designed for. This will normally be **wan**.
6. Choose the **Type**, **Static** or **Persistent**.
7. Click on the **Add** button to add this route to the routing table, or click on the **Reset** button if you want to reset all the values to their previous state.

Deleting a Route

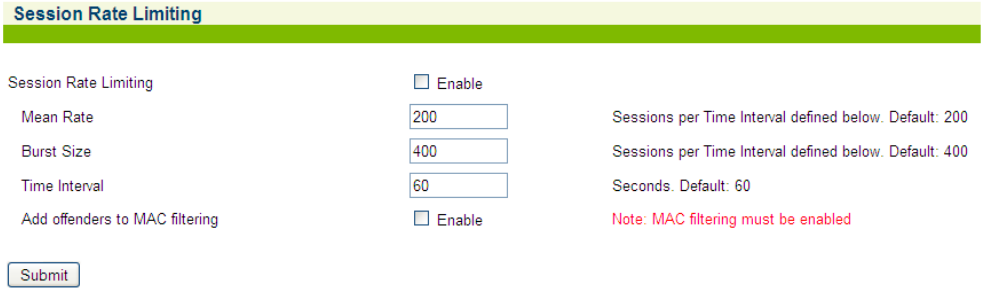
To deleted a route, click the **Delete** link in the routing table. The route is immediately deleted.

To restore a deleted route, reboot the NSE (which will restore auto-generated routes) or manually re-enter the route.

Establishing Session Rate Limiting {Session Limit}

Session Rate Limiting (SRL) significantly reduces the risk of “Denial of Service” attacks by allowing administrators to limit the number of DAT sessions any one user can take over a given time period and, if necessary, then block malicious users.

1. From the Web Management Interface, click on **System**, then **Session Limit**. The *Session Rate Limiting* screen appears:



2. Click on the check box for **Session Rate Limiting** to enable (or disable) this feature, as required.
3. Enter values for the following session “limiting” parameters:

- Mean Rate
- Burst Size
- Time Interval (in seconds)

4. Click on the **Submit** button to save your changes.

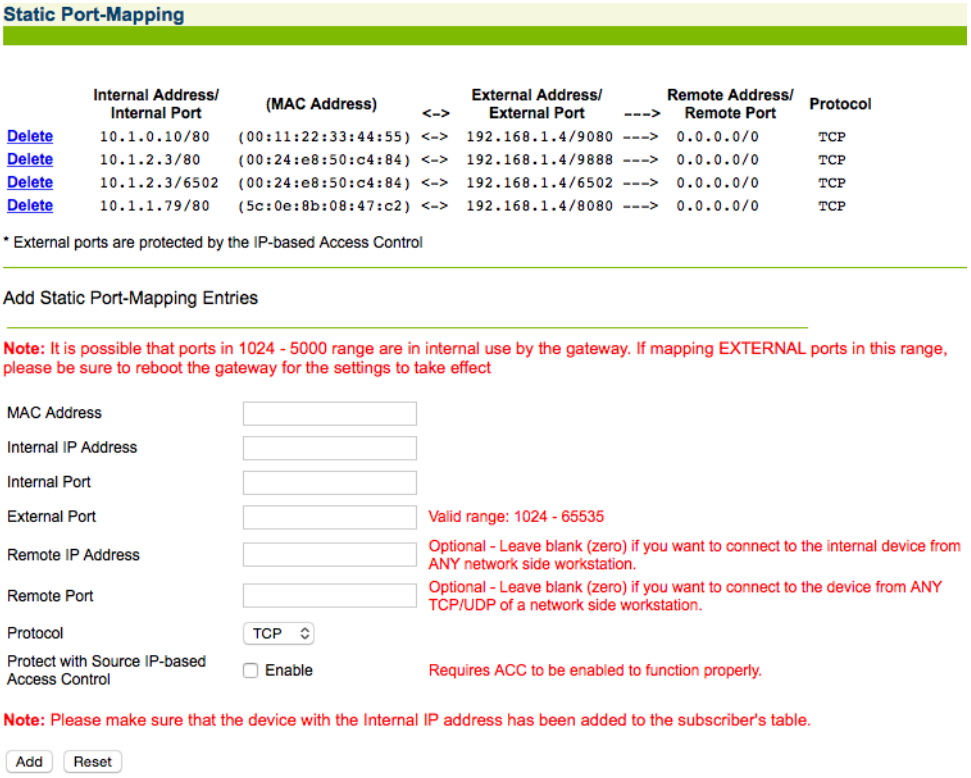
For advanced security, see also "Defining the MAC Filtering Options {MAC Filtering}" on page 261.

Adding/Deleting Static Ports {Static Port-Mapping}

Static Port-Mapping allows the network administrator to setup a port mapping scheme that forwards packets received on a specific port to a particular static IP (typically private and mis-configured) and port number on the subscriber side of the Access Gateway. The advantage for the network administrator is that free private IP addresses can be used to manage devices (such as Access Points) on the subscriber side of the Access Gateway without setting them up with public IP addresses.

To add static ports

1. From the Web Management Interface, click on **System**, then **Static Port-Mapping**. The *Static Port-Mapping* screen appears:


Static Port-Mapping
Internal Address/ Internal Port
(MAC Address)
<->
External Address/ External Port
--->
Remote Address/ Remote Port
Protocol
Delete 10.1.0.10/80 (00:11:22:33:44:55) <-> 192.168.1.4/9080 ---> 0.0.0.0/0 TCP
Delete 10.1.2.3/80 (00:24:e8:50:c4:84) <-> 192.168.1.4/9888 ---> 0.0.0.0/0 TCP
Delete 10.1.2.3/6502 (00:24:e8:50:c4:84) <-> 192.168.1.4/6502 ---> 0.0.0.0/0 TCP
Delete 10.1.1.79/80 (5c:0e:8b:08:47:c2) <-> 192.168.1.4/8080 ---> 0.0.0.0/0 TCP
* External ports are protected by the IP-based Access Control
Add Static Port-Mapping Entries
Note: It is possible that ports in 1024 - 5000 range are in internal use by the gateway. If mapping EXTERNAL ports in this range, please be sure to reboot the gateway for the settings to take effect
MAC Address
Internal IP Address
Internal Port
External Port
Valid range: 1024 - 65535
Remote IP Address
Optional - Leave blank (zero) if you want to connect to the internal device from ANY network side workstation.
Remote Port
Optional - Leave blank (zero) if you want to connect to the device from ANY TCP/UDP of a network side workstation.
Protocol
TCP
Protect with Source IP-based Access Control
Enable
Requires ACC to be enabled to function properly.
Note: Please make sure that the device with the Internal IP address has been added to the subscriber's table.
Add
Reset

2. Enter the **Internal IP Address**.

   Ensure that the device with the Internal IP Address has been added to the subscriber's table.

3. Enter the **Internal Port** reference.
4. Enter a valid **MAC Address**.

5. Enter the **External IP Address**.

   The External IP address field will default to the IP address of the Access Gateway.

6. Enter the **External Port** reference.
7. *Optional*: Enter the **Remote IP Address**. Leave this field set to zero if you want to connect to the internal device from any network-side workstation.
8. *Optional:* Enable the **Protect with Source IP-based Access Control** option. Enabling this will only allow address in the source-based access control list to connect on this port mapping. Source-based access control needs to be enabled for this to be in effect.
9. *Optional*: Enter the **Remote Port** reference. Leave this field set to zero if you want to connect to the device from any TCP/UDP port of a network-side workstation.
10. Select the protocol (**TCP** or **UDP**) from the pull-down menu.
11. Click on the **Add** button to add this static port, or click on the **Reset** button to reset all values to their previous state.

To delete static ports

1. From the Web Management Interface, click on **System**, then **Static Port-Mapping**. The *Static Port-Map* screen appears:
2. Select the item you want to delete.
3. Click on the **Delete** button to delete the static port, or click on the **Reset** button to reset your changes to their previous state.

For more information about Static Port-Mapping, see also:

- "Displaying the Static Port Mapping Table {Static Port-Mapping}" on page 189

Updating the Access Gateway Firmware {Upgrade}

Upgrading the Access Gateway firmware is performed from the Access Gateway's Command Line Interface (CLI) only. Refer to the Firmware Upgrade Procedure (separate document available from Nomadix Technical Support).

The Subscriber Interface

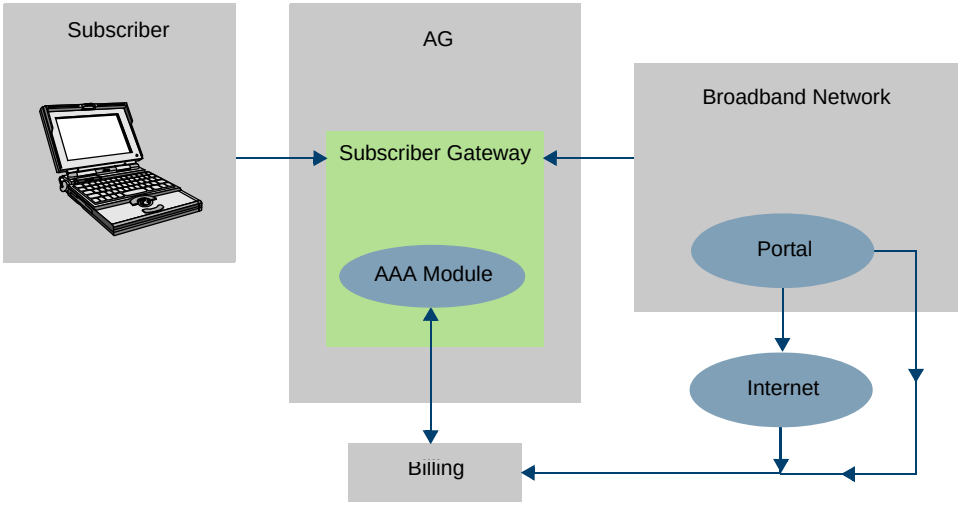
This chapter provides an overview of the Access Gateway's Subscriber Interface and sections outlining the authorization and billing processes, subscriber management models, and the Information and Control Console (ICC).

Overview

The Subscriber Interface is the window to the solution provider's Web site, and much more than that. When a subscriber accesses the solution provider's high speed network, the Access Gateway points the subscriber's browser to a sign-in page. The Access Gateway then creates a database entry that automatically records the subscriber's Media Access Control (MAC) address and integrates this address with a PMS interface for secure billing. Like a router, the Access Gateway continuously tracks subscriber IP and MAC settings, eliminating the need for further sign-ins and ensuring that subscriber usage and billing is recorded accurately. The Access Gateway also eliminates configuration issues between the subscriber's computer and the network.

The Subscriber Interface is the portal Web site of the solution provider's broadband network, and as such, its appearance and functionality reflect the needs of the solution provider. The Access Gateway is a gateway to this network, providing connection services that enable and automate an effective *Enterprise* relationship between a supplier (the solution provider) and its

customer (the subscriber). The Access Gateway's role in this customer/supplier relationship is effectively "invisible" to subscribers.

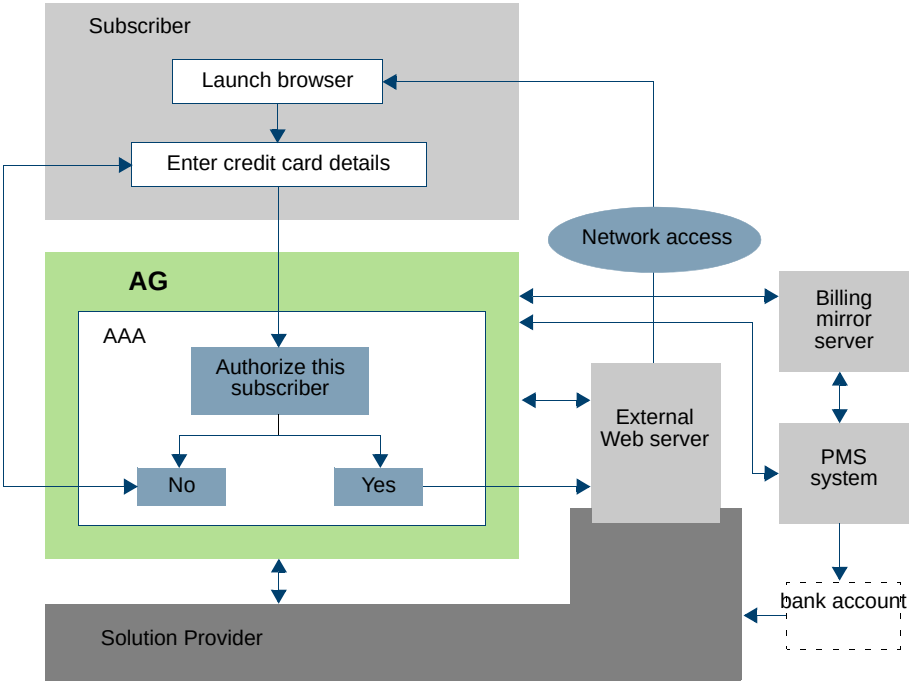


Authorization and Billing

As a gateway device, the Access Gateway enables plug-and-play access to broadband networks. Broadband network solution providers can now offer their subscribers a wide range of high speed services, including access to the Internet. Of course, a high speed Internet connection is not free – subscribers pay an access fee, based on the duration of their connection. Additionally, subscribers may want to take advantage of the solution provider's local network services (for example, purchasing goods and local services). In either case, the subscriber is required to pay. Naturally, subscribers expect to pay only for the services rendered to them.

In any environment, billing is a complex process. It requires accurate data collection and reconciliation, a means to validate and protect the data, and an efficient method for collecting payments.

The Access Gateway offers powerful billing support functionality called "Authentication, Authorization, and Accounting." This feature (also known as AAA) employs a combination of command routines designed to create a flexible, efficient, and secure billing environment. For example, when a subscriber logs into the system, their unique MAC address is placed into an authorization table. The system then authenticates the subscriber's MAC address and billing information before allowing them to access the Internet and make online purchases.

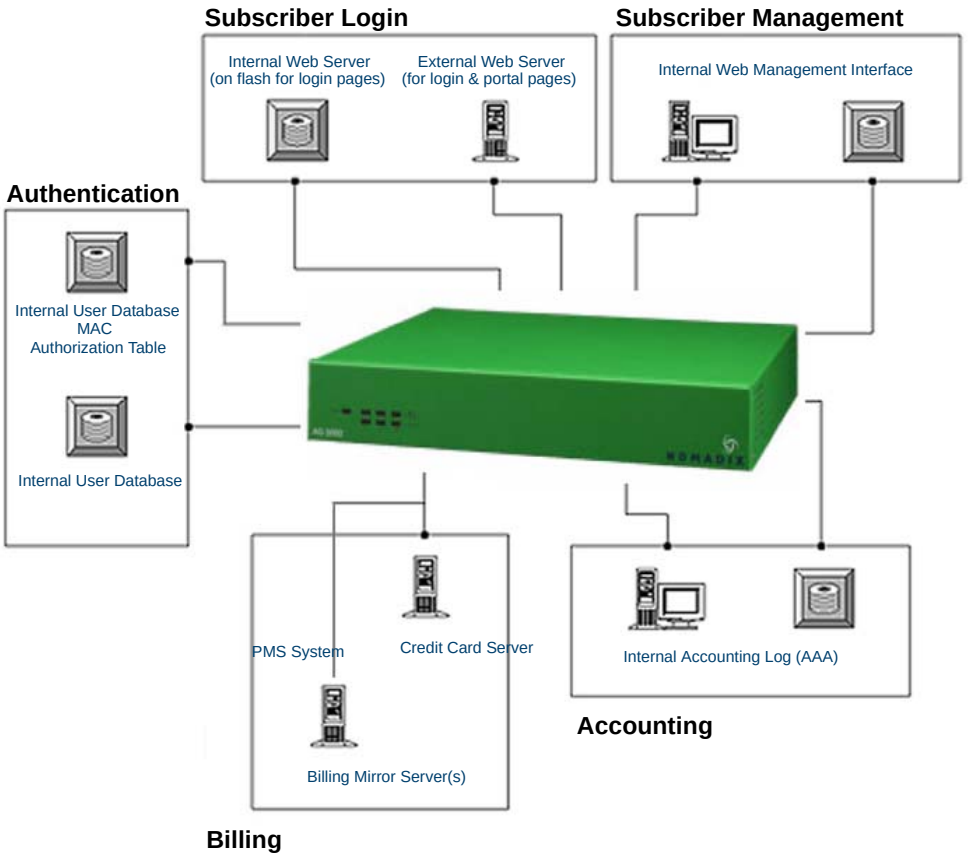


The AAA Structure

The Access Gateway's Authentication, Authorization, and Accounting (AAA) module enables the solution provider to provision, track, and bill new or returning subscribers. This includes:

- Allowing the solution provider (for example, a hotel) to bill its guests for the high speed network services it provides, track usage on the network, and deny service to those guests who have not paid.
- Allowing the solution provider to bill subscribers for services rendered, either directly on their hotel bill (in the hotel scenario), via a mailed invoice, or directly to the subscriber's credit card account.

The following illustration shows the functional relationship between the Access Gateway's internal modules and the external support systems.



The Authentication module is responsible for ensuring that when subscribers log in to the system they are correctly identified. It can identify subscribers in many different ways. For example:

- Based on their hardware (MAC) address.
- By validating their user name and password.
- By looking up subscribers on a local (flash) database.
- By looking up subscribers on a remote database.

The Authentication module can support user name and MAC address authentication simultaneously.

The initial login page can be presented in various ways, depending on the system's configuration. The Access Gateway supports any of the following methods and tools:

- Internal and external Web pages.
- External "portal" page for redirection.
- User name and MAC-based logins (simultaneous or stand-alone).
- User-selectable options and parameters (for example, defining the time purchased).
- Interaction with a Property Management System (PMS) and Web interfaces enabling administrators to edit the subscriber's input.

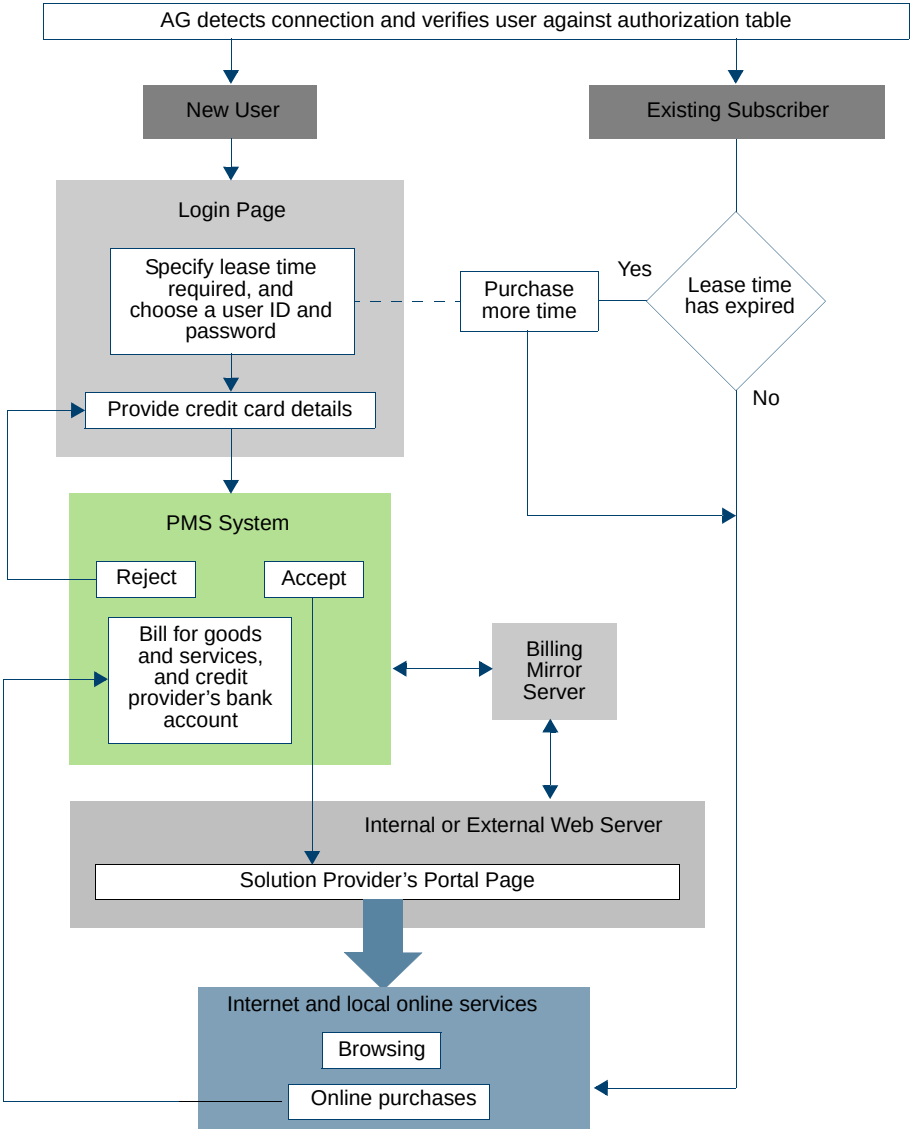
Only subscribers that are correctly identified and authenticated are authorized to access the system. Once authorized, the subscriber's activity is logged and billed through the Access Gateway's Accounting module.

The Accounting module fully supports the following functions:

- Credit card billing (for example, interaction with *AuthorizeNet*).
- User name and password verification.
- Billing verification.
- Per port-location (for example, room or unit) billing.

Process Flow (AAA)

The following flowchart outlines the AAA and billing process. All actions depicted in the chart are administered and tracked by the Access Gateway.



Internal and External Web Servers

The Access Gateway supports both internal and external Web servers which act as a login interface between subscribers and the solution provider's network, including the Internet. The internal Web server is "flashed" into the system's memory and the login page is served directly from the Access Gateway. In the external Web server model, the Access Gateway redirects the subscriber's login request to an external server. Either method is transparent to the subscriber; however, the advantage of using the internal Web server is obvious – no login redirection tasks and a faster response time for the subscriber.

Language Support

The Access Gateway's subscriber interface supports many Asian and European languages, including: English, Chinese, French, German, Japanese, and Spanish.

Home Page Redirection

The Access Gateway can be configured to redirect all valid subscribers to a Web portal or home page determined by the solution provider. After a specified time, from the first home page redirection (determined by the system administrator), subscribers are redirected again to the portal at the next Web page request.

Subscriber Management

The Access Gateway provides several subscriber management models, including:

- Free access (for example, no AAA functionality)
- MAC address
- Port-Location ID (for example, by room or unit number)
- User name and password
- Credit card

Combinations of two or more subscriber management models can be used. When a subscriber connects to the network and attempts to access the Internet, the Access Gateway looks for each model in the given order above.

Subscriber Management Models

The system administrator establishes the subscriber management model via the Command Line Interface (CLI) or the Web Management Interface. These models can be changed while the Access Gateway is running (without rebooting or interrupting the service).

- **Free Access –** If the Access Gateway is configured to disable AAA services, all subscribers will have free access to the Internet.
- **MAC Address –** Each computer with an Ethernet interface card has a unique MAC (hardware) address. The Access Gateway can be configured to allow access for specified MAC addresses. In this model, when a subscriber attempts to access the Internet, the Access Gateway validates the subscriber's MAC address against a MAC authorization table. If the MAC address is verified, the Access Gateway authorizes access to the Internet. A possible scenario for using this model is to allow Internet access to administrative personnel in all locations.
- **User Name and Password –** Each subscriber can choose a unique user name and password (and be charged for it). In this model, when a subscriber attempts to access the Internet, they are prompted for the user name and password before access is authorized. Possible scenarios in which this model is appropriate include allowing subscribers to use more than one computer or when subscribers want to move between locations.
- **Credit Card –** In this model, when subscribers connect to the network and attempt to access the Internet, they are prompted for their credit card information. The Access Gateway is pre-configured to use the *Authorize.Net* service and you will need to open a merchant trading account with them before using this subscriber management model.

Configuring the Subscriber Management Models

Model	What You Need To Do
Free access	Disable the AAA services.
MAC address	Enable the AAA services and add a subscriber profile to the database for each MAC address you want to enable.
User Name and Password	Enable the AAA services and Usernames. Add a subscriber profile to the database for each user name and password you want to enable. You will need to request a unique user name and password when they pay for the service. The user name and password are optional (the MAC address will be substituted), but in this event the service is not transferable between computers.
Credit card	Enable the AAA services. You have the choice of enabling the Access Gateway's internal authorization module or using an external credit card authorization server. Internal Authorization Enabled Enter the credit card server's URL and IP address, then enter the merchant ID you obtain from Authorize.Net. If you have NOT enabled Internal Authorization Set up your own external authorization server with your merchant ID. Enter the secret key (the default is *bigbrowndog*). Enter the external authorization server's URL, then enter its IP address as a pass-through IP address.

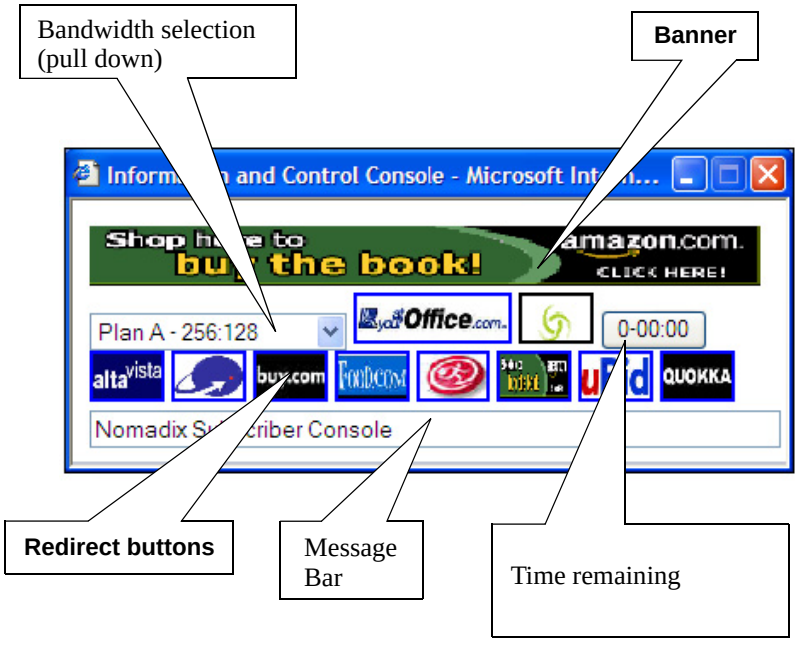
Information and Control Console (ICC)

The ICC is a HTML pop-up window that is presented to subscribers, allowing them to select their bandwidth and billing options quickly and efficiently, and displays a dynamic “time” field to inform them of the time remaining on their account. The ICC also offers service providers an opportunity to display advertising banners and provide a choice of redirection options.

For information about configuring the ICC, refer to “Defining Languages {Language Support}” on page 231.

ICC Pop-Up Window

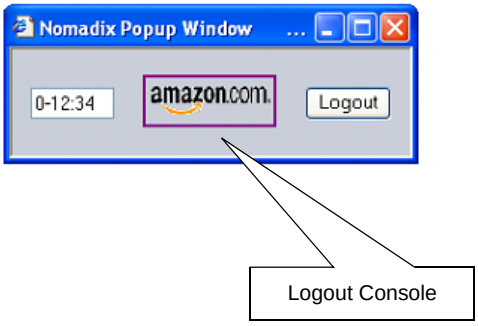
The ICC displays a HTML-based applet in the form of a pop-up window from which subscribers can dynamically control their billing options and bandwidth, and which allows service providers to display advertising banners and redirect their subscribers to predetermined Web sites.



The pop-up window automatically displays at Home Page Redirection (HPR) or whenever the subscriber brings up a new browser window.

Logout Console

The Access Gateway allows System Administrators to define a simple HTML-based pop-up window for explicit logout that can be used as an alternative to the more fully featured ICC. The pop-up Logout Console can display the elapsed/count-down time and one logo for intra-session service branding.



Quick Reference Guide

This chapter contains product reference information, organized by topic. Use this chapter to locate the information you need quickly and efficiently.

Web Management Interface (WMI) Menus

The following tables contain a listing and brief explanation of all menus and menu items contained in the Access Gateway's Web Management Interface (WMI), listed as they appear on screen.

Menus	Description
Configuration Menu	Displays the *Configuration* menu. Items in this menu let you establish IP parameters, set DHCP options, set DNS and home page redirection options, set MAC-based authentication, display configuration settings, and set the system date and time, SNMP and SYSLOG parameters.
Network Info Menu	Displays the *Network Info* menu. The items in this menu are used to monitor and review network connections, routings, protocols, and network session statistics.
Port-Location Menu	Displays the *Port-Location* menu. Items in this menu let you find, add, remove, and update the Port-Location Assignments (for example, VLAN tags).
Subscriber Administration Menu	Displays the *Subscriber Administration* menu. The items in this menu allow you to add, remove, and monitor subscriber profiles, display the current DHCP leases, and monitor the subscribers currently connected to the network.
Subscriber Interface Menu	Displays the *Subscriber Interface* menu. The items in this menu allow you to define how the subscriber interface is displayed to users and what information it contains.
System Menu	Displays the *System* menu. Items in this menu let you manage login names and passwords, configuration settings, and routings.

Configuration Menu Items

Item	Description
AAA	Establishes the AAA service options.
Access Control	To enable secure administration of the product, the Nomadix Access Gateway incorporates a master access control list that checks the source (IP address) of administrator logins. A login is permitted only if a match is made with the master list contained on the Nomadix Access Gateway. If a match is not made, the login is denied, even if a correct login name and password are supplied. The access control list supports up to 50 (fifty) entries in the form of a specific IP address or range of IP addresses. Additionally, the Nomadix Access Gateway offers access control based on the type of Interface being used. This feature allows administrators to block access from Telnet, Web Management, and FTP sources.
Auto Configuration	Provides an effortless and rapid method for configuring devices for fast network roll-outs.
Bandwidth Management	Manages the bandwidth for subscribers, defined in Kbps (Kilobits per seconds) for both upstream and downstream data transmissions.
Bill Record Mirroring	Configures the Nomadix Access Gateway to send copies of billing records to external servers.
Class-Based Queueing	Define multiple groups (classes) of users, to support priority and guaranteed minimum bandwidth on a per-group basis
Clustering	Automatically distribute subscribers across gateways.
Destination HTTP Redirection	Configure redirection of HTTP requests to one or more portal page URLs.
DHCP	Assigns the Nomadix Access Gateway as its own DHCP server, or enables the DHCP relay for an external server.
DNS	Sets up the DNS parameters, including the host name, domain, and the primary and secondary DNS servers.
Dynamic DNS	Sets parameters for Dynamic DNS.
GRE Tunneling	Sets GRE Tunneling parameters.

Item	Description
Home Page Redirect	Redirects the subscriber's browser to a specified home page.
iNAT™	Enables Intelligent Address Translation for Transparent VPN Access.
Interface Monitoring	The ability to actively monitor each WAN/ISP/ and VLAN connection to assure that full network functionality exists
IPSec	IPsec is an end-to-end security scheme operating in the Internet Layer of the Internet Protocol Suite. It can be used in protecting data flows between a pair of hosts (host-to-host), between a pair of security gateways (network-to-network), or between a security gateway and a host (network-to-host). Can be used in the transport layer or used to create a secure tunnel
IPv6	Allows direct network management through IPv6
Load Balancing	Ensures that demands placed on high-speed Internet access (HSIA) are balanced based on the capability of each WAN/ISP connection.
Location	Sets up your location and IP addresses for the network, subscriber, subnet mask, and default gateway.
Logging	Enables logging options for the system and AAA functions.
MAC Authentication	Enables MAC authentication, retry frequency, MAC address format, MAC address hex-alpha case, and RADIUS service profile.
Passthrough Addresses	Establishes IP pass-through addresses (up to 300).
PMS	Enables one of the listed PMS options, or allows you to disable the PMS feature.
Port-Location	Establishes the Access Concentrator settings.
QoS	Configure mode and polices for Quality of Service metrics.
RADIUS Client	Set up the RADIUS client.
RADIUS Proxy	Establishes RADIUS proxies, where different realms can be set up to directly channel RADIUS messages to the various RADIUS servers.

Item	Description
Realm-Based Routing	Realm-Based Routing provides advanced NAI (Network Access Identifier) routing capabilities, enabling multiple service providers to share a HotSpot location, further supporting a Wi-Fi wholesale model. This functionality allows users to interact only with their chosen provider in a seamless and transparent manner.
Routed Subscribers	Allows Routed network hops on the Subscriber side of the Nomadix.
SMTP	Enables the SMTP (E-mail) redirection functions.
SNMP	Establishes the SNMP parameters.
Subnets	Enables dynamic multiple subnet support.
Summary	Displays a summary listing of all configuration settings.
Time	Sets the system date and time.
Traffic Descriptors	Bandwidth consumed over time, active allocated bandwidth, number of using bandwidth and network capacity,
URL Filtering	Dynamically adds or removes up to 300 specific IP addresses and domain names to be filtered for each property.
User-Agent Filtering	User agent Filtering is a capability that can filter software that is acting on behalf of a user, such as browsers.
Zone Migration	The present disclosure is directed to providing a network user the ability to travel between different zones or locations within a network environment, such as, for example, a hospitality location, without requiring a user to re-login to the new location.

Network Info Menu Items

Item	Description
ARP	Displays the ARP table, including the destination IP address and the gateway MAC address.
DAT	Displays the DAT session table.
DNSSEC	DNSSEC support adds authentication and integrity capability to DNS systems. The DNSSEC feature in the NSE allows DNSSEC queries and responses to traverse the NSE between subscribers and the NSE's configured DNS servers. The NSE itself does not participate in DNSSEC trust relationships with subscribers.
Hosts	Displays the host table, including host names, associated IP addresses and any assigned aliases.
ICMP	Displays the ICMP (Internet Control Message Protocol) performance statistics.
Interfaces	Displays statistics for the interfaces.
IP	Displays the IP performance statistics.
IPSec	IPsec is an end-to-end security scheme operating in the Internet Layer of the Internet Protocol Suite. It can be used in protecting data flows between a pair of hosts (host-to-host), between a pair of security gateways (network-to-network), or between a security gateway and a host (network-to-host). Can be used in the transport layer or used to create a secure tunnel.
Login Page Failover	For installations that use an External Web Server or a Portal Server to provision their Login and Authentication Pages to the subscribers, the Login Page Failover feature provides a way for administrators to configure secondary or tertiary Login Pages in case the primary Login Page becomes unavailable. This mechanism guarantees that the subscribers will have some way of authenticating themselves and accessing the Internet if the External and Portal Servers fail.

Item	Description
NAT IP Interface	A new separate iNAT interface page shows the settings for each port in either WAN or OOS modes. Ports in SUB mode are not shown. Each of the displayed ports has individual iNAT / Subscriber tunnel settings accessible by clicking on that port's link. A new improved interface allows easy deletion of any iNAT address range.
Packet Capture Summary	Displays the different interfaces and the information of how many packets are seen and captured when the Packet capture feature under System -> Packet capture is running for that interface.
Routing	Displays the routing tables and performance statistics.
Sockets	Displays the active Internet connections.
Static Port-Mapping	Displays the currently active static port-mapping scheme.
TCP	Displays the TCP performance statistics.
UDP	Displays the UDP performance statistics.

Port-Location Menu Items

Items	Description
Add	Adds or updates port-location assignments.
Delete All	Deletes all port-location assignments. *Use this command with caution.*
Export	Exports specified port-location assignments to the *location.txt* file.
Find by Description	Finds a port-location assignment, based on a unique description.
Find by Location	Finds a port-location assignment, based on a specified location.
Find by Port	Finds a port-location assignment, based on a specified port.
Import	Imports specified port-location assignments from the *location.txt* file.
List	Displays the port-location file, listing all port-location assignments.

Subscriber Administration Menu Items

Items	Description
Add	Adds subscriber profiles to the database.
Current	Displays a list of all currently connected subscribers.
Delete by MAC	Deletes a subscriber, based on a specific MAC address.
Delete by User	Deletes a subscriber, based on a specific user name.
DHCP Leases	Sets up the current subscriber DHCP leases.
Expired	Removes expired profiles.
Find by MAC	Finds a subscriber profile, based on a specified MAC address.
Find by User	Finds a subscriber profile, based on a specified user name.

Items	Description
List Profiles	Displays a list of authorized subscriber profiles.
RADIUS Session History	These logs record RADIUS proxy accounting messages sent or received by the RADIUS proxy.
Statistics	Displays the current subscriber profile statistics (for example, how many profiles are currently in the database).

Subscriber Interface Menu Items

Items	Description
Billing Options	Establishes the various billing plans and rates (schemes), including messages and appearance.
ICC Setup	Sets up the Information and Control Console (ICC) for subscribers.
Language Support	Defines the language to be displayed on the Web Management Interface and the subscriber's portal page.
Local Web Server	Upload the required pages and images to the /flash/web directory using FTP. Total file size of all pages and images cannot exceed 200 KB.
Login UI	Defines the appearance of the internal subscriber login user interface, including all the login messages and fonts, etc., and establishes the currency.
Post Session UI	Defines the post session "Goodbye" page.
Subscriber Buttons	Defines how each of the subscriber's user interface control buttons are displayed.
Subscriber Labels	Defines how the subscriber's user interface field labels are displayed.
Subscriber Errors, 1 of 2	Defines how error messages are displayed to subscribers (page 1 of 2).
Subscriber Errors, 2 of 2	Defines how error messages are displayed to subscribers (page 2 of 2).
Subscriber Messages, 1 of 3	Defines how "other" general messages are displayed to subscribers (page 1 of 3).
Subscriber Messages, 2 of 3	Defines how "other" general messages are displayed to subscribers (page 2 of 3).
Subscriber Messages, 3 of 3	Defines how "other" general messages are displayed to subscribers (page 3 of 3).
Subscriber Messages, TOA	Text for Terms of Agreement. Can be created using the internal web server.

System Menu Items

Items	Description
ARP	Adds or deletes an Address Resolution Protocol (ARP) table entry.
Bridge Mode	Enables the Bridge Mode option.
Dynamic Proxy	A function that assures a subscriber can be connected.
Export	Exports the system's configuration settings to an archive file.
Factory	Imports the factory default settings.
Fail Over	Sets up a "sibling" Nomadix Gateway, allowing one device to take up the users should the other device become disconnected from the network.
History	Displays a history log of the system's activity, including *Access*, *Reboot* and *Uptime*.
ICMP	Sets up ICMP blocking for traffic from "pending" or "non authenticated" users that are destined to addresses other than those defined in the pass-through (walled garden) list.
Import	Imports previously exported system configuration settings from an archive file.
Login	Sets up the login name and password.
Mac Filtering	Blocks malicious users based on their MAC address. Up to 50 MAC addresses can be blocked at any one time.
Memory Utilization	Displays a listing of the current system Memory and how much is allocated, free, or in use.
Packet Capture	
Reboot	Reboots the Nomadix Access Gateway.
Routing	View Nomadix Access Gateway's routing table; Add or delete a route to a specific IP destination.
Session Limit	Limits the number sessions any one user can take over a given time period and, if necessary, then blocks malicious users.
Static Port Mapping	Set up or delete static port-mapping schemes.

Items	Description
Subscriber Interfaces	Blocks subscriber interfaces.
Syslog	Displays syslog history.
System Utilization	Displays system utilization information.
Upgrade	Obtain the latest Firmware Upgrade Procedure from Nomadix Technical Support.
User Settings	Blocks IPPROTO traffic from misconfigured subscribers.

Alphabetical Listing of Menu Items (WMI)

The menu items listed here are for a fully featured Nomadix Access Gateway (with all optional modules included). Refer to "About Your Product License" on page 80.

Item	Description	Menu
AAA	Set AAA options	Configuration
Access Control	Enables secure administration of the Access Gateway	Configuration
Add	Add or update port-location assignments	Port-Location
Add	Add subscriber profiles to the database	Subscriber Admin
ARP	Display the ARP table	Network Info
ARP Add	Add an ARP table entry	System
ARP Delete	Delete an ARP table entry	System
Bandwidth Management	Define upstream and downstream bandwidth	Configuration
Billing Options	Establish the billing options	Subscriber I'face
Bill Record Mirroring	Enable bill record copying to external servers	Configuration
Bridge Mode	Enable the Bridge Mode option	System
Current	Display currently connected subscribers	Subscriber Admin
Clustering	Set Clustering options	Configuration
DAT	Display the DAT session table	Network Info
Delete All	Delete all port-location assignments	Port-Location
Delete by Location	Delete port-location assignments by location	Port-Location
Delete by MAC	Delete subscriber profiles by MAC address	Subscriber Admin
Delete by Port	Delete port-location assignments by port	Port-Location
Delete by User	Delete subscriber profiles by user	Subscriber Admin
DHCP	Set the DHCP service options	Configuration
DHCP Leases	Set the current subscriber DHCP leases	Subscriber Admin
DNS	Set the DNS parameters	Configuration
Expired	Remove all expired subscriber profiles from database	Subscriber Admin
Export	Export configuration settings to the archive file	System
Export	Export port-location assignments to file	Port-Location
Factory	Import the factory default configuration settings	System
FailOver	Sets up a "sibling" Nomadix Gateway	System
Find by Description	Find port-location assignments by description	Port-Location
Find by Location	Find port-location assignments by location	Port-Location
Find by MAC	Find a subscriber profile by MAC address	Subscriber Admin
Find by Port	Find port-location assignments by port	Port-Location
Find by User	Find a subscriber profile by user name	Subscriber Admin
History	Display the system's history log	System
Home Page Redirect	Redirect the subscriber's browser	Configuration
Hosts	Display the host table	Network Info
ICC Setup	Sets up the Information and Control Console	Subscriber I'face
ICMP	Display ICMP performance statistics	Network Info
ICMP	Sets up ICMP blocking	System
Import	Import configuration settings from the archive file	System
Import	Import port-location assignments from file	Port-Location
iNAT	Enable translation for transparent VPN access	Configuration
Interfaces	Display performance statistics for interfaces	Network Info
IP	Display IP performance statistics	Network Info
Language Support	Define different languages	Subscriber I'face
List	Display the room file	Port-Location
List by MAC	List the subscriber database, sorted by MAC address	Subscriber Admin
List by User	List the subscriber database, sorted by user name	Subscriber Admin
Location	Establish your location and network IP parameters	Configuration
Logging	Enable system and AAA logging options	Configuration
Login	Establish access for managers and operators	System
Login UI	Establish the internal login screen settings	Subscriber I'face
Mac Filtering	Blocks traffic based on MAC address	System
Passthrough Addresses	Establish up to 100 IP pass-through addresses	Configuration
Port-Location	Establish the access concentrator settings	Configuration
Post Session UI	Sets up the post session "Goodbye" page	Subscriber I'face
RADIUS Client	Sets up RADIUS client options	Configuration
RADIUS Proxy	Establishes RADIUS proxies	Configuration
RADIUS Routing	Sets up service profiles and realm-based routing policies	Configuration

Reboot	Reboot the operating system	System
Route Add	Add a route to the routing table	System
Route Delete	Delete a route from the routing table	System
Routing	Display routing performance statistics and tables	Network Info
Session Limit	Limits subscriber sessions	System
SMTP	Set the SMTP redirection options	Configuration
SNMP	Establish the SNMP parameters	Configuration
Sockets	Display the active IP connections	Network Info
Static Port-Mapping	Displays currently active static port-mapping schemes	Network Info
Static Port-Mapping Add	Adds a static port-mapping scheme	System
Static Port-Mapping Delete	Deletes a static port-mapping scheme	System
Statistics	Display the subscriber profile statistics	Subscriber Admin
Subnets	Enable dynamic multiple subnet support	Configuration
Subscriber Buttons	Define how control buttons are displayed to subscribers	Subscriber I'face
Subscriber Interfaces	Blocks subscriber interfaces	System
Subscriber Labels	Define how field labels are displayed	Subscriber I'face
Subscriber Errors	Define how error messages are displayed	Subscriber I'face
Subscriber Messages	Define how "other" general messages are displayed	Subscriber I'face
Summary	Display a summary of the configuration settings	Configuration
TCP	Display the TCP performance statistics	Network Info
Time	Set the system date and time	Configuration
UDP	Display the UDP performance statistics	Network Info
Upgrade	Upgrade the Access Gateway system firmware	System
URL Filtering	Define URLs for filtering	Configuration

Default (Factory) Configuration Settings

The following table shows a partial listing of the Access Gateway's primary default configuration settings (the settings established at manufacturing). For a complete listing of the factory default settings, refer to the factory.txt file. For more information, go to "Importing the Factory Defaults {Factory}" on page 253.

Function	Default Setting
Version Nomadix Access Gateway ID Network Interface MAC Subscriber Interface MAC	Nomadix Access Gateway v5.4.xxx (depends on firmware version) AG3100 MAC address is unique for each product MAC address is unique for each product
Network Interface IP Subscriber IP Subnet Mask Default Gateway IP DHCP Client Admin IP	10.0.0.10 10.0.0.11 255.255.255.0 10.0.0.1 Enabled 172.30.30.172
Domain Host Name Primary DNS Secondary DNS Tertiary DNS	nomadix. AG3100 0.0.0.2 0.0.0.0 0.0.0.0
DHCP Relay External DHCP Server IP DHCP Relay Agent IP DHCP Server DHCP Server IP DHCP Subnet Mask DHCP Pool Start IP DHCP Pool End IP Lease Duration Minutes	Disabled 0.0.0.0 0.0.0.0 Enabled 10.0.0.4 255.255.255.0 10.0.0.12 10.0.0.250 1440
Home Page Redirection Parameter Passing Redirection Frequency Minutes	Disabled Disabled 3600
Dynamic Address Translation (DAT)	Enabled (cannot be changed)

Function	Default Setting
AAA Logging AAA Log Server Number AAA Log Server IP SYSLOG (System Logging) SYSLOG Server Number SYSLOG Server IP	Disabled 3 0.0.0.0 Disabled 2 0.0.0.0
AAA Services Internal Authorization New Subscribers Credit Card Service Parameter Passing Usernames XML	Disabled Enabled Enabled Enabled Disabled Enabled Disabled
DNS Redirection SMTP Redirection SMTP Server IP	Enabled Disabled 0.0.0.0
SNMP SNMP Get Community SNMP Set Community SNMP Trap IP	Disabled public private 0.0.0.0
System Administration Login User Name System Administration Password	admin admin

Product Specifications

AG2400 Specifications
AVAILABLE NSE MODULES AG 2400 Hospitality Module AG 2400 High Availability Module
PERFORMANCE 200 concurrent users or devices Throughput up to 230 Mbps as defined by RFC 1242, Section 3.17
PLATFORM Intel based System
INTERFACE 1-RJ 45 - WAN 3-RJ 45 - ETH 1-12VDC Power Connector 1-RJ 45 - Console 1-DB-9 Serial Connector 2-USB Connectors 1-Reset 1-Power Button
POWER REQUIREMENTS Type/Watts: 12VDC 5A 60W Power Adapter Input: AC 100-240V @ 50-60 HZ ~ .6A

AG2400 Specifications
DIMENSIONS 215.5 W x 44 H x 190mm D 1U Rack Mountable **WEIGHT** 1.2 kg **ENVIRONMENTAL PARAMETERS** Temperature Ambient Operating / Storage: 0~40° / -20~70° C Humidity (RH) Ambient Operating / Ambient Non-Operating: 5~90% non-condensing / 5~95% non-condensing
REGULATORY FCC Class A UL, UL (US and Canada) CE (Emissions) CB Scheme (CE Safety)
CONCURRENT USERS 200 devices
ACCESS CONTROL AND AUTHENTICATION Tri-Modal Authentication, Authentication and Accounting (AAA) Walled Garden Group Accounts Universal Access Method over SSL IEEE 802.1x Smart Client Support (Boingo, IPass) MAC Authentication Remember Me Log-in
ADVANCED SECURITY iNAT IPSec Support PPTP Support Session Rate Limiting (SRL) User Agent Filtering Mac Address Filtering URL Filtering ICMP Blocking Proxy ARP for device-to-device communication

AG2400 Specifications
BILLING PLAN ENABLEMENT RADIUS CLIENT Radius (AAA) Proxy Port-Based Policies Port Mapping Local Databases Credit Card Interface PMS Advanced XML Interface Bill Mirroring **BRANDING (ESTABLISHMENT)** Parameter Passing enabling branding
NETWORK MANAGEMENT Web Management Interface (WMI) Command Line Interface (CLI) Integrated VPN Client for Management Radius-Driven Configuration Multi-Level Admin Support Centralized Radius Authentication SMTP Redirection Access Control Bridge Mode SNMPv2c Syslog/AAALog **MEDIA ACCESS CONTROL** CSMA/CA
PORTS 10/100/1000 Base-T Ethernet, RJ-45 (UTP): WAN5-10/10/100/1000 Base-T Ethernet RJ-45 (UTP) LAN RJ-45 port for Serial Access Systems Console DB9 Serial Port: Property Management Interface

AG2400 Specifications
IP ADDRESS MANAGEMENT IEEE 802.3/3u/3eb IEEE 802.1d DHCP Server DHCP Relay Multiple Subnet Support IP UPsell DHCP Client PPPoe Client
INTELLIGENT ROAMING Realm-Based Routing Zone Migration **SERVICE PROVISIONING** Home Page Redirect HTTP-Redirect HTTPS-Redirect Portal Page Redirect Session Termination Redirect Information and Control console Pop-up (explicit) logout button International Language Support External Web Server Mode Internal Web Server Mode Secure XML API over SSL Login Page Failover
USER TRUE PLUG AND PLAY Dynamic Address Translation

AG5600 Specifications

AVAILABLE NSE MODULES

High Availability - Fail Over
Hospitality Module - Property Management Interface (PMS)

PERFORMANCE

User Support: Up to 2000 users concurrently
Throughput: up to 750Mbits/s*
*As defined by RFC1242, Section 3.18

PHYSICAL

1U rack space in a 19” rack
17.24”(L) x 11.53”(W) x 1.73”(H)
438mm (L) x 292.0mm (W) x 44mm (H)
Weight: 8.8 lbs.
Weight: 4.00 Kg

OPERATING VOLTAGE

100 – 240 VAC, 50/60Hz, Auto Sensing

POWER CONSUMPTION

65 watts

ENVIRONMENTAL

Operating temperature: 0°C to 40° C
Storage temperature: 10°C to 70° C
Operating humidity: 20 - 90% RH non-condensing
Storage humidity: 5 - 95% RH
Altitude: Up to 15,000ft

AG5600 Specifications
COMPLIANCE UL UL (US and Canada) FCC Class A CE: EN 55022: 2006 + A1: 2007 EN 55024: 1998 + A1: 2001 + A2: 2003 IEC 61000-4-2: 1995 +A1: 1998 + A2: 2000 IEC 61000-4-3: 2006 IEC 61000-4-4: 2004 IEC 61000-4-5: 2005 IEC 61000-4-6: 2007 IEC 61000-4-8: 1993 : A1: 2000 IEC 61000-4-11: 2004 EN 61000-3-3: 1995 +A1: 2001 +A2: 2005 Low Voltage Directive: European Council Directive 2006/95/EC IEC 60950-1: 2005 (2nd Edition) EN60950-1:2006 + A11: 2009
INTERFACES 2 x 10/100/1000 Mbps GigE (RJ-45) LAN 1 x 10/100/1000 Mbps GigE (RJ-45) WAN 1 x DB9 serial (PMS Interface) 1 x Front Access RJ-45 serial system console
LED INDICATORS ACT/LINK and 10/100/1000 for each Ethernet port Power
NETWORK MANAGEMENT Multi-Level Administration Controls Integrated VPN Client (IPSec) for secure connection to an NOC Access Control Lists Web Administration UI CLI via Telnet and Serial Port SNMPv2c Secure XML API Auto Configuration and Upgrades Syslog/AAA log

AG5600 Specifications
NETWORKING IEEE 802.3/ 3u/ 3ab IEEE 802.1d DHCP Server DHCP Relay RADIUS Client (MD-5, PAP, CHAP, MS-CHAPv1, v2)

AG5800 Specifications
USER TRUE PLUG AND PLAY Dynamic Address Translation (DAT) Dynamic Transparent Proxy
SERVICE PROVISIONING Home Page Redirect HTTP - Redirect Portal Page Redirect Session Termination Redirect Information and Control console Pop-up (Explicit) Logout Button International Language Support External Web Server Mode Internal Web Server Mode Secure XML API over SSL Login Page Failover
BILLING PLAN ENABLEMENT RADIUS Client RADIUS (AAA) Proxy Port Based Policies Port Mapping Local Database Credit Card Interface PMS Advanced XML Interface Bill Mirroring

AG5800 Specifications
ACCESS CONTROL AND AUTHENTICATION Authorization, Authentication and Accounting (AAA) Walled Garden Group Accounts Tri Mode Authentication Universal Access Method over SSL IEEE 802.1x Smart Client Support (Boingo, iPass) MAC Authentication Remember Me Log-in
ADVANCED SECURITY iNAT IPSec Support PPTP Support Session Rate Limiting (SRL) User Agent Filtering Mac Address Filtering URL Filtering ICMP Blocking Proxy ARP for device to device communication
POLICY BASED TRAFFIC SHAPING Bandwidth Management QoS Tagging Group Bandwidth Management
IP ADDRESS MANAGEMENT IEEE 802.3/ 3u/ 3ab IEEE 802.1d DHCP Server DHCP Relay Multiple Subnet Support IP UPsell DHCP Client PPPoE Client
INTELLIGENT ROAMING Realm-Based Routing Zone Migration

AG5800 Specifications
BRANDING Parameter Passing-enabled branding
NETWORK MANAGEMENT Web Management Interface (WMI) Command Line Interface (CLI) Integrated VPN Client for Management RADIUS-Driven Configuration Multi-level Admin Support Centralized Radius Authentication SMTP Redirection Access Control Bridge Mode SNMPv2c Syslog/AAALog
MEDIA ACCESS CONTROL CSMA/CA
PORTS 10/100/1000 Base-T Ethernet, RJ-45 (UTP): WAN 5 – 10/100/1000 Base-T Ethernet, RJ-45 (UTP): LAN Front access RJ-45 port for serial System Console DB9 serial port: Property Management Interface
POWER 100 – 240 VAC, 50/60Hz, 220 watts
ENVIRONMENT Operating temperature: 0°C to 40° C Storage temperature: -20°C to 70° C Operating humidity: 5 - 90% RH Storage humidity: 5 - 95% RH non-condensing Altitude: Up to 15,000ft

AG5800 Specifications
REGULATORY FCC Class A UL, UL (US and Canada) CE EN 55022: 2010 Class A, EN 61000-3-2:2006/A1:2009/A2:2009, EN 61000-3-3:2008, EN55024:2010 (IEC 61000-4-2:2008, IEC 61000-4-3:2006/A1:2007/A2:2010, IEC 6100-4-4:2004/A1:2010, IEC 6100-4-5:2006, IEC 61000-4-6:2008, IEC 61000-4-8:2009, IEC 6100-4-11:2004), Australian Standard AZ/NZS CISPR 22:2009 Class A CB Scheme
PHYSICAL 1U rack space in a 19” rack 17”(L) x 12”(W) x 1.75”(H) 431mm (L) x 305.0mm (W) x 44.4mm (H) Weight: 10.2 lbs. Weight: 4.6 Kg
LED INDICATORS Power Indicator Status Indicator ACT/LINK and 10/100/1000 for each Ethernet port
PERFORMANCE *User Support:* Up to 4000 users or devices concurrently *Throughput:* up to 970Mbits/s* *As defined by RFC1242, Section 3.18

AG5900 Specifications

USER TRUE PLUG AND PLAY

- Dynamic Address Translation (DAT)
- Dynamic Transparent Proxy

SERVICE PROVISIONING

- Home Page Redirect
- HTTP - Redirect
- HTTPS - Redirect
- Portal Page Redirect
- Session Termination Redirect Information and Control Console
- Pop-Up (Explicit) Logout Button
- International Language Support
- External Web Server Mode
- Internal Web Server Mode
- Secure XML API over SSL
- Login Page Failover

BILLING PLAN ENABLEMENT

- RADIUS Client
- RADIUS (AAA) Proxy
- Port Based Policies
- Port Mapping
- Local Database
- Credit Card Interface
- Bill Mirroring

AG5900 Specifications
ACCESS CONTROL AND AUTHENTICATION Authorization, Authentication and Accounting (AAA) Walled Garden Group Accounts Tri Mode Authentication Universal Access Method over SSL IEEE 802.1x Smart Client Support (Boingo, iPass) MAC Authentication Remember Me Log-in
ADVANCED SECURITY iNAT IPSec Support PPTP Support Session Rate Limiting (SRL) User Agent Filtering Mac Address Filtering URL Filtering ICMP Blocking Proxy ARP for device to device communication
POLICY BASED TRAFFIC SHAPING Bandwidth Management QoS Tagging Group Bandwidth Management
IP ADDRESS MANAGEMENT IEEE 802.3/3u/3ab IEEE 802.1d DHCP Server DHCP Relay Multiple Subnet Support IP Upsell DHCP Client PPPoE Client
INTELLIGENT ROAMING Realm-Based Routing Zone Migration

AG5900 Specifications
BRANDING Parameter Passing-enabled branding
NETWORK MANAGEMENT Web Management Interface (WMI) Command Line Interface (CLI) Integrated VPN Client for Management RADIUS-Driven Configuration Multi-level Admin Support Centralized Radius Authentication SMTP Redirection Access Control Bridge Mode SNMPv2c Syslog/AAA Log
MEDIA ACCESS CONTROL CSMA/CA
PORTS 10/100/1000 Base-T Ethernet, RJ-45 (UTP): WAN 5 – 10/100/1000 Base-T Ethernet, RJ-45 (UTP): LAN Front access RJ-45 port for serial System Console DB9 serial port: Property Management Interface
POWER 100 – 240 VAC, 50/60Hz, 220 watts
ENVIRONMENT Operating temperature: 0°C to 40° C Storage temperature: -20°C to 70° C Operating humidity: 5 - 90% RH Storage humidity: 5 - 95% RH non-condensing

AG5900 Specifications
REGULATORY FCC Class A UL, UL (US and Canada) CE EN 55022: 2010 Class A, EN 61000-3-2:2006/A1:2009/A2:2009, EN 61000-3-3:2008 EN55024:2010 (IEC 61000-4-2:2008, IEC 61000-4-3:2006/A1:2007/A2:2010, IEC 6100-4-4:2004/A1:2010, IEC 6100-4-5:2006, IEC 61000-4-6:2008, IEC 61000-4-8:2009, IEC 6100-4-11:2004), Australian Standard AZ/NZS CISPR 22:2009 Class A CB Scheme
PHYSICAL 1U rack space in a 19” rack 17”(L) x 12”(W) x 1.75”(H) 431mm (L) x 305.0mm (W) x 44.4mm (H) Weight: 10.2 lbs. Weight: 7 Kg
LED INDICATORS Power Indicator Status Indicator Memory Indicator ACT/LINK and 10/100/1000 for each Ethernet port
PERFORMANCE *User Support:* Up to 8000 users or devices concurrently *Throughput:* up to 1425Mbits/s, *as defined by RFC1242, Section 3.18*

Sample AAA Log

The following table shows a sample AAA log. This log is generated by the Access Gateway and sent to the SYSLOG server that is assigned to AAA logging.

Date	Time	Access Gateway Name	Type of Data	Log Code	Log Message	Subscriber MAC Address	Expi-ration Time
Mar 31	18:23:10	nomad237 .nomadix .com	INFO	AAA: 4207	AAA_Authentication Successful	00:00:0E:32:2 C:BC	2 hrs 1 min
Mar 31	18:23:26	nomad237 .nomadix .com	INFO	AAA: 4207	AAA_Authentication Successful	00:10:5A:61:40 :FF	12 hrs 0 min
Mar 31	18:21:53	nomad237 .nomadix .com	INFO	AAA: 4106	AAA_lookup Added_in_memory_ta ble_ pending	00:00:0E:32:2 C:BC	
Mar 31	18:43:54	nomad237 .nomadix .com	INFO	AAA: 4208	AAA_Authentication Unsuccessful_Error	00:60:08:B4:20 :6A	
Mar 31	21:34:21	nomad237 .nomadix .com	INFO	AAA: 4007	AAA_Interface Added_by_administrat or	00:00:0:12:34: 56	20 hrs 34 min
Mar 31	21:35:15	nomad237 .nomadix .com	INFO	AAA: 4009	AAA Interface Updated_by_administr ator	00:00:0:12:34: 56	2 hrs 34 min
Mar 31	21:36:05	nomad237 .nomadix .com	INFO	AAA: 4006	AAA Interface Removed_by_administ rator	00:00:0:12:34: 56	

Message Definitions (AAA Log)

The six basic messages are defined as follows:

Message	Definition
AAA_Authentication Successful	Subscriber profile was successfully added to the Access Gateway authorization table after being authenticated by the credit card server.

Message	Definition
AAA_Authentication Unsuccessful_Error	Subscriber profile was not added to the Access Gateway authorization table because the credit card server did not recognize the transaction.
AAA_lookup Added_in_memory_table_pending	Subscriber profile has been recognized and the Access Gateway is waiting to authenticate the user.
AAA_Interface Added_by_administrator	Subscriber profile was manually added to the authorization table.
AAA_Interface Updated_by_administrator	Subscriber profile was updated.
AAA_Interface Removed_by_administrator	Subscriber profile was manually removed from the authorization table.

Sample SYSLOG Report

Syslog reports are generated by the Access Gateway and sent to the syslog server that is assigned to general error detection and reporting.

2003-02-10 11:25:53 Local2.Info 1.2.3.4 INFO [Access Gateway v51.4.126]

DHCP: ndxDHCPInit: 0021 DHCP initialized

2003-02-10 11:25:53 Local2.Info 1.2.3.4 INFO [Access Gateway v51.4.126]

CLISRD: 0206 Setting COM1 to 9600 baud

2003-02-10 11:25:53 Local2.Info 1.2.3.4 INFO [Access Gateway v51.4.126]

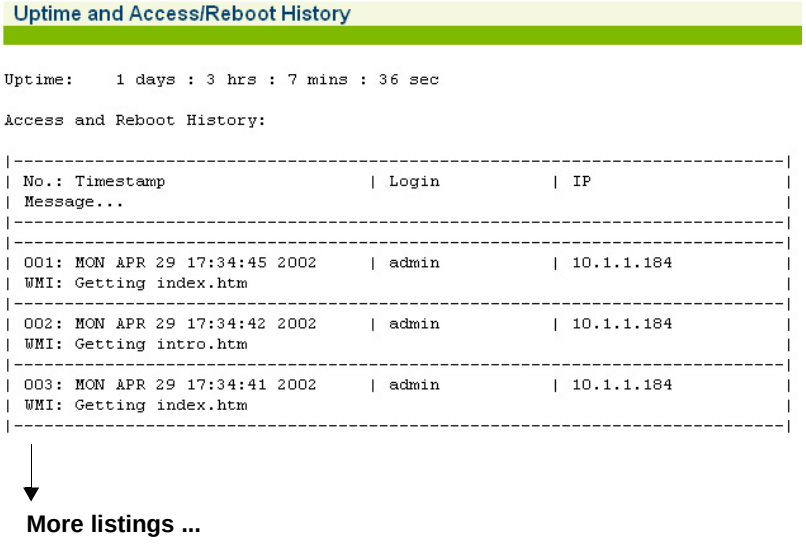
CLISRD: Starting CLI on the serial port

2003-02-10 11:25:53 Local2.Info 1.2.3.4 INFO [Access Gateway v51.4.126]

INIT: Access Gateway v51.4.126 with ID 010384 Initialized

Sample History Log

A history log is generated by the Access Gateway which includes the system's activity (Access, Reboot and Uptime).



Uptime and Access/Reboot History

```
Uptime:    1 days : 3 hrs : 7 mins : 36 sec

Access and Reboot History:

|-------------------------------------------------------------------------|
| No.: Timestamp                    | Login          | IP                 |
| Message...                                                              |
|-------------------------------------------------------------------------|
|-------------------------------------------------------------------------|
| 001: MON APR 29 17:34:45 2002     | admin          | 10.1.1.184         |
| WMI: Getting index.htm                                                  |
|-------------------------------------------------------------------------|
| 002: MON APR 29 17:34:42 2002     | admin          | 10.1.1.184         |
| WMI: Getting intro.htm                                                  |
|-------------------------------------------------------------------------|
| 003: MON APR 29 17:34:41 2002     | admin          | 10.1.1.184         |
| WMI: Getting index.htm                                                  |
|-------------------------------------------------------------------------|
```

More listings ...

Keyboard Shortcuts

The following table shows the most common keyboard shortcuts.

Action	Keyboard Shortcut
Cut selected data and place it on the clipboard.	Ctrl + X
Copy selected data to the clipboard.	Ctrl + C
Paste data from the clipboard into a document (at the insertion point).	Ctrl + V
Copy the active window to the clipboard.	Alt + Print Screen
Copy the entire desktop image to the clipboard.	Print Screen
Abort an action at any time.	Esc
Go back to the previous screen.	b
Access the Help screen.	?

HyperTerminal Settings

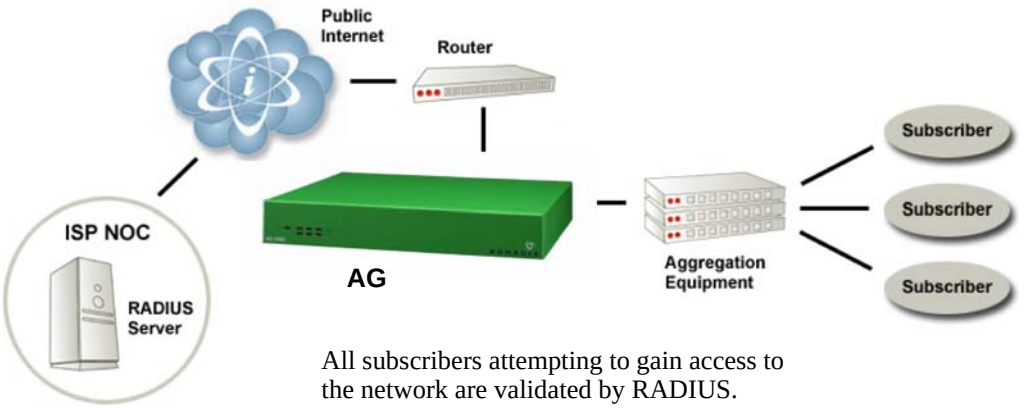
Use the following settings when establishing a HyperTerminal session.

Item	Setting
Bits per second	9600
Data bits	8
Parity	None
Stop bits	1
Flow control	None

RADIUS Attributes

RADIUS (Remote Authentication Dial-In User Service) was originally created to allow remote authentication to the dial-in networks of corporations and dial-up ISPs. It is defined and standardized by the IETF (Internet Engineering Task Force) and several RADIUS server packages exist in both the public domain and for commercial sale.

RADIUS software stores a database of attributes about their valid subscriber base. For example, usernames, passwords, access privileges, account limits and subscriber attributes can all be stored in a RADIUS database. RADIUS works in conjunctions with NAS (Network Access Server) devices to determine if access to the service network should be granted, and if so, with what privileges.



All subscribers attempting to gain access to the network are validated by RADIUS.

When a subscriber attempts to access the service provider's network, the Access Gateway delivers a Web page to the subscriber asking for a login name and password. This information (password) is encrypted and sent across the network to the ISP's RADIUS server. The RADIUS server decrypts the information and compares it against its list of valid users. If the subscriber can be authenticated, the RADIUS server replies to the Access Gatewaywith a message instructing it to grant access to the subscriber. Optionally, the RADIUS server can instruct the NAS to perform other functions; for example, the RADIUS server can tell the Access Gatewaywhat upstream and downstream bandwidth the subscriber should receive. If RADIUS cannot authenticate the subscriber, it will instruct the NAS to deny access to the network.

The Nomadix Access Gateway RADIUS functionality can be broken down into the following categories:

- Authentication-Request
- Authentication-Reply (Accept)
- Accounting-Request
- Selected Detailed Descriptions
- Nomadix Vendor-Specific RADIUS Attributes

Authentication-Request

- Username
- Password
- Service-Type
- NAS-Port (port number)
- NAS-Identifier
- Framed-IP Address
- NAS-IP Address
- NAS-Port-Type
- Acct-Session-ID
- Log-Off-URL
- EAP-Packet (used for 802.1x)
- Message-Authenticator (used for 802.1x)
- State (used/tested for 802.1x)
- Called-Station-ID
- Calling-Station-ID

Authentication-Reply (Accept)

- Reply-Message
- Reject-Message
- State (used/tested for 802.1x)

- Class
- Session-Timeout
- Idle-Timeout
- EAP-Packet (used for 802.1x)
- Message-Authenticator (used for 802.1x)
- Acct-Interim-Interval
- Nomadix VSAs:
  - Nomadix-Bw-Up
  - Nomadix-Bw-Down
  - Nomadix-URL-Redirection
  - Nomadix-IP-Upsell
  - Nomadix-MaxBytesUp
  - Nomadix-MaxBytesDown
  - Nomadix-Net-VLAN
  - Nomadix-Session-Terminate-End-Of-Day
  - Nomadix-Subnet
  - Nomadix-Expiration

Accounting-Request

- Username
- Acct-Status-Type (Start/Stop/Update)
- Acct-Session-ID
- Acct-Output-Octets
- Acct-Input-Octets
- Acct-Output-Packets
- Acct-Input-Packets
- Class
- Nomadix VSAs:
  - Nomadix-Subnet
  - Nomadix-URL-Redirection
  - Nomadix-IP-Upsell

- Acct-Session-Time (Stop)
- Terminate-Cause (Stop)
- NAS ID
- NAS-IP Address
- NAS-Port-Type
- NAS-Port
- Framed-IP Address
- Acct-Delay-Time
- Called-Station-ID
- Calling-Station-ID
- MaxBytesTotal
- MaxGigawordsTotal

Selected Detailed Descriptions

Acct-Session-ID

The Acct-Session-ID is created when the RADIUS authentication request is built. It is transmitted in both the Access-Request and the Accounting-Request.

Session Timeout

There is currently no default session timeout that you can set in the Access Gateway Web Management Interface (WMI). If the Radius server does not send a Session-Timeout, the Access Gateway will set the subscriber expiration time to 0, which means access forever.

Log-Off-URL

Allows for the placement of a log off URL (for example, 1.1.1.1) on an external portal page.

MaxBytesTotal

Number of total bytes, to support volume-based billing for total of upstream and downstream traffic. Note that MaxBytesTotal will reset to zero at 4 gigabytes. Use with MaxGigawordsTotal if volume of data may exceed 4 gigabytes.

MaxGigawordsTotal

Number of total gigabytes, to support volume-based billing for total of upstream and downstream traffic. Note that MaxGigawordsTotal is an integer value; use with MaxBytesTotal if you need volume granularity of more than 4 gigabytes.

Idle Timeout

The WMI allows the setting of a default timeout. If the Radius server does not send an Idle-Timeout in the Radius Access-Accept, the Access Gateway will use the default one to disconnect subscribers. “0” means forever.

Timeout Detection

If a subscriber is sending traffic through the Access Gateway, the Access Gateway will immediately detect a Session-Timeout. However in the case of an Idle-Timeout or an inactive subscriber Session-Timeout, the Access Gateway detects it via a clean-up function that is currently called every 2 minutes. Thus the current precision for sending the Acct-Stop is about 2 minutes.

Subscriber Session Duration

Acct-Session-Time is calculated the following way (for each transmitted/retransmitted Acct-Stop):

Acct-Session-Time = time of last sent packet - subscriber login time.

Another attribute, Acct-Delay-Time, will take into consideration the time spent in retransmissions.

Interim Accounting Updates

The Access Gateway parses the attribute Acct-Interim-Interval in an Access-Accept. If this attribute is present the Access Gateway tries every [Acct-Interim-Interval] seconds to send a Radius Accounting Interim message for the specific subscriber. If this attribute is not present or equal to 0, no Interim message is sent.

The precision is 2 minutes. The Access Gateway will not send Interim messages more frequently than every 2 minutes.

Called-Station-ID

This is the Media Access Control (MAC) address of the Access Gateway.

Calling-Station-ID

This is the Media Access Control (MAC) address of the client's computer.

New Attributes in Acct-Request

The Access Gateway has to send the following attributes in an Accounting-Stop:

- Acct-Output-Packets: number of packets sent by subscriber.
- Acct-Input-Packets: number of packets received by subscriber.

Upon a reboot, these 2 attributes are saved in *currfile.dat* the same way as for Acct-Input-Octets and Acct-Input-Octets.

If you plan to implement RADIUS, go to "Contact Information" on page 349 *for Nomadix Technical Support.*

Nomadix Vendor-Specific RADIUS Attributes

Nomadix provides the following vendor-specific RADIUS attributes. This list may vary depending on your configuration.

Attribute	Integer Value	Description
Nomadix-BW-Up	1	Value (in Kbps) restricts the speed at which uploads are performed.
Nomadix-BW-Down	2	Value (in Kbps) restricts the speed at which downloads are performed.
Nomadix-Url-Redirection	3	Allows the administrator to redirect the user to a page of the administrator's choice each time the user logs in
Nomadix-IP-Upsell	4	Allows the user to receive a public address from a DHCP pool when the NSE has This feature enabled.
Nomadix-Expiration	5	Allows the administrator to set an expiration date and time for a user.
Nomadix-Subnet	6	Specifies which DHCP pool the user should receive their DHCP lease from.

Attribute	Integer Value	Description
Nomadix-MaxBytesUp	7	When the number of bytes sent exceeds this value, the user will be logged out of their Radius session. To continue their Internet access the user would have to log in again.
Nomadix-MaxBytesDown	8	When the number of bytes received exceeds this value, the user will be logged out of their Radius session. To continue their Internet access the user would have to log in again.
Nomadix-Session-Terminate-End-Of-Day	9	When this attribute is enabled for the user, the NSE will log the user out at midnight.
Nomadix-Logoff-Url	10	Passed in the Access Request to the Radius server. This is a required attribute for WISPr. Implementation is determined by the property owner.
Nomadix-Net-Vlan	11	Specifies which vlan number NSE should tag the packets with when going out the network port
Nomadix-Config-Url	12	The ftp URL that the NSE will use to download its auto-configuration file
Nomadix-Goodbye-Url	13	The URL that the NSE will redirect the user to after they log out
Nomadix-Qos-Policy	14.	Specifies which QoS policy will be applied to the user.
Nomadix-SMTP-Redirect	17.	Specifies whether or not the user will be redirected to the configured SMTP server.

Attribute	Integer Value	Description
Nomadix-Centralized-Mgmt	18	Sets the access for users to the Web Management Interface, Telnet/CLI interface, FTP and the Remote Radius Login test page.
Nomadix-Group-Bw-Policy-ID	19	The ID for the bandwidth group.
Nomadix-Group-Max-Up	20	Value (in Kbps) restricts the speed at which uploads for the entire group are performed
Nomadix-Group-Max-Down	21	Value (in Kbps) restricts the speed at which downloads for the entire group are performed
Nomadix-MaxGigaWords-UP	22	Allows for volume based sessions greater than 4gig
Nomadix-MaxGigaWords-Down	23	Allows for volume based sessions greater than 4gig
Nomadix-Preferred-WAN	24	Either WAN, Eth1, Eth2, Eth3, Eth4, or Eth5 to identify what interface the user will try to send traffic on.
Nomadix-Bw-Class-Name	27	Class name in dotted notation
Nomadix-MaxBytesTotal	28	Total amount of traffic up and down for a user before being logged off
Nomadix-MaxGigawordsTotal	29	Allow more than 4 gig of total traffic to be monitored before logging user off

Setting Up the SSL Feature

This section describes how to set up the Access Gateway's SSL feature.

Prerequisites

- You should be a business that is qualified to obtain an SSL secure server ID from different Certificate Authorities (CAs), such as VeriSign. The Certificate Authority sets this qualification criterion.
- You will need to generate your own Private Key and Certificate Signing Request (these instructions are provided below).
- You must obtain your own Signed Public Key from the Certificate Authority. The selected Certificate Authority should be commonly supported in the subscribers' browser. We recommend that you use VeriSign (all instructions in this document are based on obtaining a key from VeriSign). Please contact Nomadix Technical Support if you want to use a different Certificate Authority.

For Nomadix technical support, go to "Contact Information" on page 349.

Obtain a Private Key File (cakey.pem)

To create a Private Key File, you must install OpenSSL on your Windows 9x or NT operating system on a PC with Internet access.

Requirements for Certificate Signing Request (CSR) and Key Generation

- Cygwin and OpenSSL application installed on Windows 9x or NT.
- 5 large random files residing on the workstation (large compressed log files recommended by VeriSign). These files are put in as file1:file2:file3:file4:file5 in the key generation command.

Downloading Cygwin

There are several sources for obtaining "Cygwin" to install OpenSSL. One popular source is: http://sources.redhat.com/cygwin/.

Nomadix used Cygwin version 1.3.2 for generating this section of the User Guide.

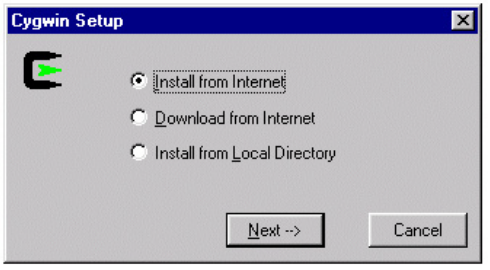
Installing Cygwin and OpenSSL on a PC

The example in this document is based on downloading the software with Netscape 4.75.

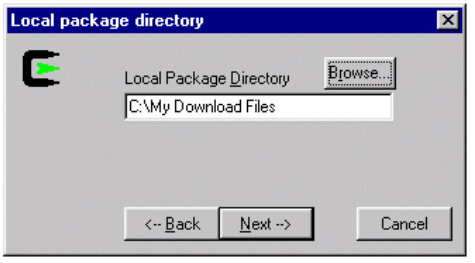
The procedure starts from the *Cygwin Net Release Setup Program* screen:

Click on the **Next** button.

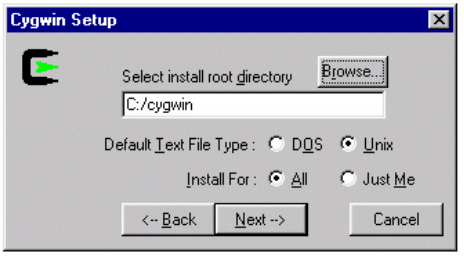
The following screen appears:



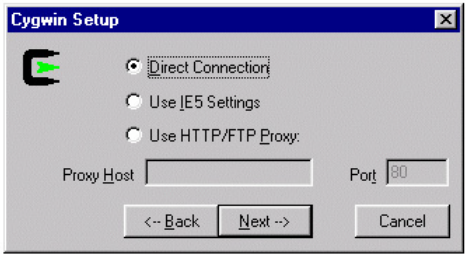
Click on the **Next** button to display the next setup screen.



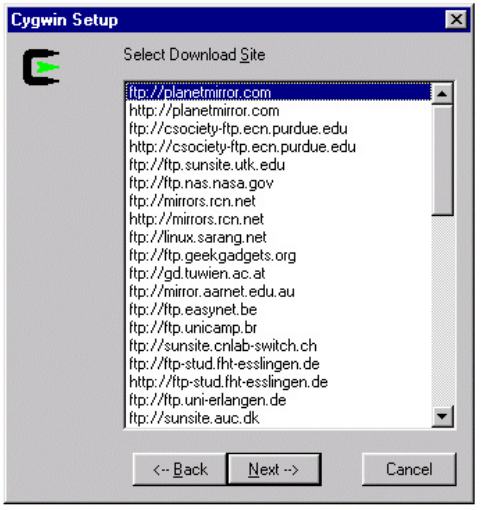
Click on the **Next** button to display the next setup screen.



Click on the **Next** button to display the next setup screen.



Click on the **Next** button to display the next setup screen.

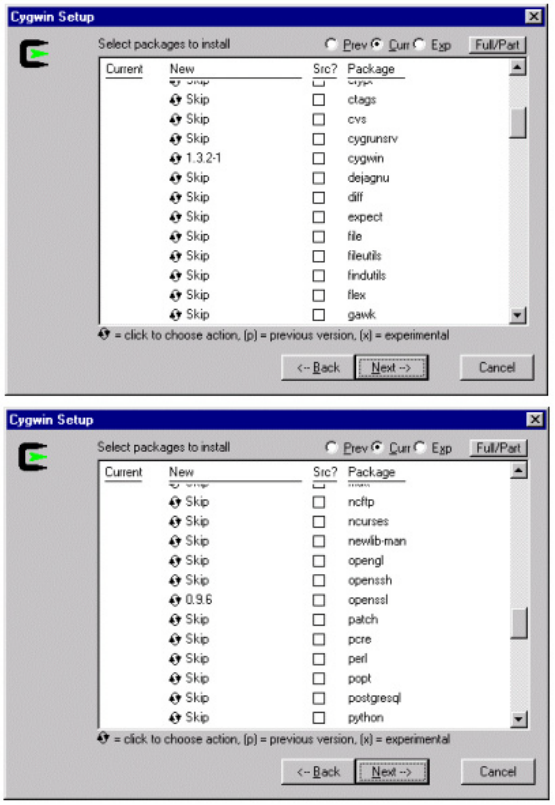


Select a location and click on the **Next** button.

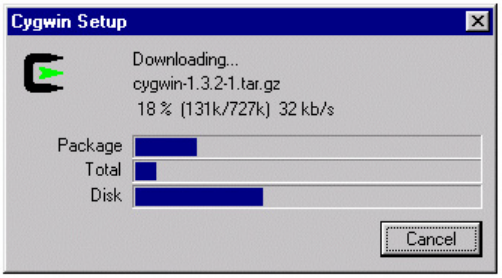
For the purposes of this document, Nomadix used: ftp://planetmirror.com.

In the following screens, please skip all packages except “cygwin” and “openssl,” then click on the Next when you are done.

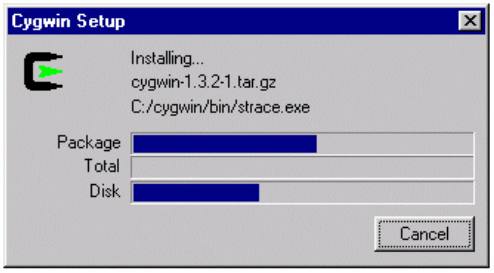
At the time of this writing, there are more than 70 packages to install. Please ensure that you “skip” all of them except the two packages mentioned above.



Click on the **Next** button to start the “download” process. Wait for the download process to complete.



Click on the **Next** button to start the “install” process. Wait for the install process to complete.



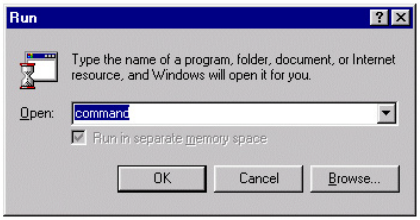
There will be a pop-up dialog to inform you that the installation process is completed. At the pop-up dialog, click on the **OK** button.

Private Key Generation

Create a directory from Root and put 5 random files, **a.dat**, **b.dat**, **c.dat**, **d.dat**, and **e.dat** (see note) into the C:\cygwin\bin\ directory (or the directory where you installed openssl.exe).

These random files can be any file type, such as Word, Excel, etc. Change the files to .dat files (shown above). All files must follow the DOS naming format (maximum 8 characters).

Run the “command” prompt from Windows, then click on the **OK** button.



Go to the c:\cygwin\bin\ directory and run the following command:

>openssl genrsa -rand file1:file2:file3:file4:file5 1024 > cakey.pem

The following table provides an explanation of the command elements:

openssl	“openssl” command.
genrsa	A parameter for “openssl” to generate an RSA key.
Rand	A parameter for “openssl” to generate a random number from the files list.
file1:file2…:file5	These five large random files are residing on the workstation (large compressed log files recommended by VeriSign). These files are entered in the key generation command as file1:file2:file3:file4:file5
>	Output to.
cakey.pem	The file that contains the private key. You must have the file name “cakey.pem” to be used in the Access Gateway.

Because there is a parameter buffer size limitation of the “openssl” command, the argument length should not have more than 80 characters.

If you are creating multiple keys, please output them into different directories and save them as different names. However, if you are saving them as different names, you must change the names back to “cakey.pem” when trying to FTP to the Access Gateway.

Do not include “-des3” option to keep the private key in an unencrypted form.

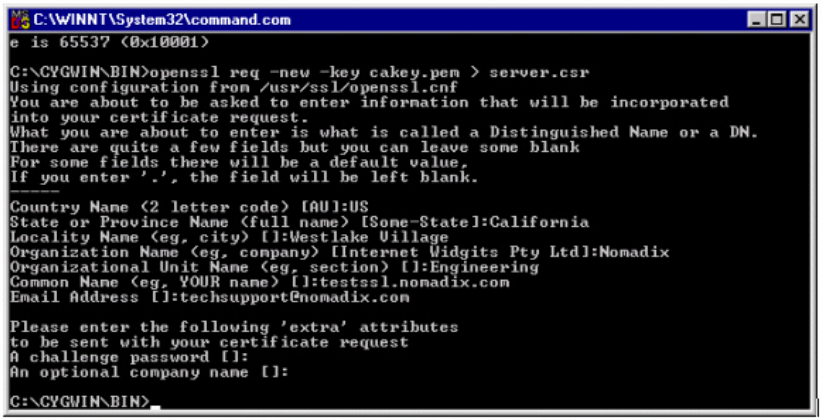
Here is the output of cakey.pem:

```
-----BEGIN RSA PRIVATE KEY-----
MIICXAIBAAKBgQCf/oRXNthhvRhOSy9o/PFHdgyahbeIFtvUZ2eX6jghhVfm/FYU
TXupzPo4IWggwzITQpnzVj2xUWVkr4DogdwZ2yU8qiKb1GtIItWfgOcVOaxgP6GM
PAaDIthZd8xxVVGyHeYkt98FCif6yDwcH9EfRMfYgRxvIVnFrctbxR+G/wIDAQAB
AoGAP+1oX5iweMOfixkLhn2awpzuiEdpf9zyVTpD8DVL3Ej1SHwGwPH8uWoHiKoA
eybDOWLhNJN+7vzA8KwXa8+Ha8NzFgFPrh41fDo+RuoGPtcyUo8OSj24h8PsSshN
UYkeDSAcZWrEyqXOX5nce43bOQGEe4VV/8xEmUCbwz7u1OECQQDUZ8gqkdmj43Y6
OqbPLWtauF+yf4SU7zC49m2pQhvDsaAL2+K5dA7Fm5NpNfYaUVkhHpT+LZO/gLyz
Al2fGEjvAkEAwNTxYDTZICtGJoXh9goN+PIlpfnMQJb3GWx2d4Lx7OZq+UqXBBYD
KqGpv9jK51/+Kd1DVlawWD5hSUI4Il8C8QJAdHwZ7SahadyjiNmDg5kQB+eXK8f9
CMSIPtd+WlWT7mVqNTa4hyYbt81TNV7Pga1dKOmhoieSoHJUigNhHo/t5wJAYzuy
U64epn1ehmiTlggqlJgYY8efIwYNd1nnxSzvztfs6QlHmeSyEHhNYNrx4Av4QhcJ
lh7adS7O5bxcIuP+IQJBAM5CE/vzwfF48Wqoiff2jcc6wH85j2Sbzs45nWE8FFiv
r4Wm55vA2RDO+fom832CwwPPqUin95Y6tz/ZLzddG9g=
-----END RSA PRIVATE KEY-----
```

Create a Certificate Signing Request (CSR) File

Run the following command to generate the certificate signing request:

>openssl req -new -key cakey.pem > server.csr


C:\WINNT\System32\command.com
e is 65537 (0x10001)
C:\CYGWIN\BIN>openssl req -new -key cakey.pem > server.csr
Using configuration from /usr/ssl/openssl.cnf
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.

Country Name (2 letter code) [AU]:US
State or Province Name (full name) [Some-State]:California
Locality Name (eg, city) []:Westlake Village
Organization Name (eg, company) [Internet Widgits Pty Ltd]:Nomadix
Organizational Unit Name (eg, section) []:Engineering
Common Name (eg, YOUR name) []:testssl.nomadix.com
Email Address []:techsupport@nomadix.com
Please enter the following 'extra' attributes
to be sent with your certificate request
A challenge password []:
An optional company name []:
C:\CYGWIN\BIN>

The following table provides an explanation of the command elements:

openssl	“openssl” command
req	A parameter for creating a request
new	Defining a “new” request …
key	… from private key
>	Output to …
server.csr	… the output file

Fill in your company information. If “States” or “Province” names do not exist in your country, please repeat the “Locality Name.”

The “Common Name” is the name used in the Access Gateway->AAA->SSL Certificate Domain Name. The Common Name in the Public Key must match the SSL Certificate Domain Name in the Web Management Interface of the Access Gateway (refer to the Access Gateway setup information later in this document).

Here is the output of server.csr:

```
-----BEGIN CERTIFICATE REQUEST-----
MIIB7DCCAVUCAQAwgasxCzAJBgNVBAYTAlVTMRMwEQYDVQQIEwpDYWxpZm9ybmlh
MRkwFwYDVQQHExBXZXNObGFrZSBWaWxsYWdlMRAwDgYDVQQKEwdOb21hZG14MRQw
EgYDVQQLEwtFbmdpbmVlcmluZzEcMBoGA1UEAxMTdGVzdHNzbC5ub21hZG14LmNv
bTEmMCQGCSqGSIb3DQEJARYXdGVjaHN1cHBvcnRAbm9tYWRpeC5jb20OwgZ8wDQYJ
KoZIhvcNAQEBBQADgYOAMIGJAoGBAJ/+hFc22GG9GE5LL2j88Ud2DJqFt4gW29Rn
Z5fqOCGFV+b8VhRNe6nM+jghaCDDMhNCmfNWPbFRZWSvgOiB3BnbJTyqIpvUaOgi
1Z+DRxXRrGA/oYw8BoMi2Fl3zHFVUbId5iS33wUKJ/rIPBwfOR9Ex9iBHG8hWcWt
y1vFH4b/AgMBAAGgADANBgkqhkiG9w0BAQQFAAOBgQA2Sey1BiO1d4oOPOzY6LBE
CqliHv2L1st2cBJG6UkfyfyA/cvReA8COOFMWR3mRHFvflEbS9Q9G+Ff22Noz62m
RASOQCIPyiddbxV58uqNsshfUNPIucyeL3dOndF3Ow75BL8cJip6nt/YtK4fnUUt
n7zDKpZChyl9G/zYME4NQw==
-----END CERTIFICATE REQUEST-----
```

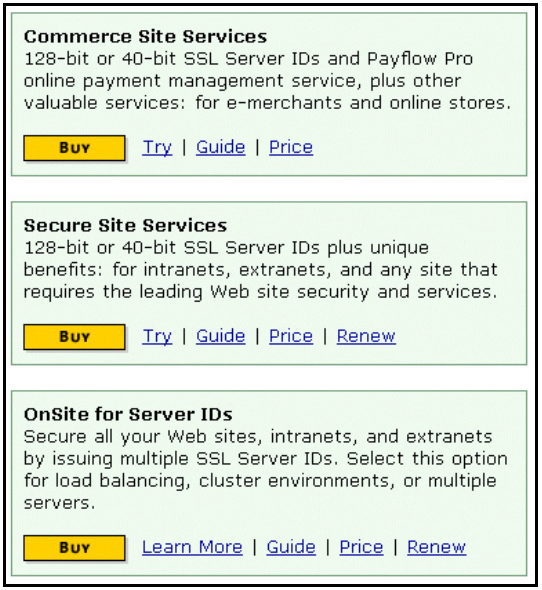
Create a Public Key File (server.pem)

VeriSign Purchasing Process

The signing process varies by Certificate Authority. Generally, you will need to send a Certificate Signing Request to the Certificate Authority (CA) and the CA will create a public key base on the certificate request.

This is the procedure to get a 40-bit encryption or 128-bit Public Key from VeriSign.

With IE or Netscape, go to www.verisign.com/products/site/index.html.


Commerce Site Services
128-bit or 40-bit SSL Server IDs and Payflow Pro online payment management service, plus other valuable services: for e-merchants and online stores.
Buy
Try | Guide | Price
Secure Site Services
128-bit or 40-bit SSL Server IDs plus unique benefits: for intranets, extranets, and any site that requires the leading Web site security and services.
Buy
Try | Guide | Price | Renew
OnSite for Server IDs
Secure all your Web sites, intranets, and extranets by issuing multiple SSL Server IDs. Select this option for load balancing, cluster environments, or multiple servers.
Buy
Learn More | Guide | Price | Renew

Select **Buy** for Secure Site Service.

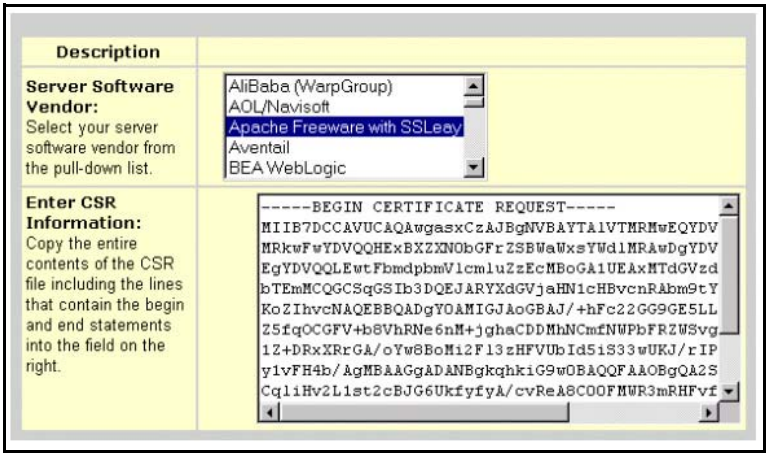
Secure Site Services
For intranets, extranets, or any security-focused Web site that requires the leading SSL certificates and Web site solutions, Secure Site Services provide you with all of the authentication and encryption power and added features you need. Choose Secure Site with a 40-bit SSL (Secure Server) ID or select Secure Site Pro with a 128-bit SSL (Global Server) ID.
Securing 5 or more servers? You need OnSite for Server IDs
Features:
Secure Site
Secure Site Pro
Need help? Contact our Sales Team.
$349
$895
Buy Now
Buy Now
Core Features:
VeriSign SSL Encryption
40-bit
128-bit
VeriSign Authentication Service
VeriSign Secure Site Seal
VeriSign NetSure - Protection
$100K
$250K

Select **Buy Now** for 40-bit SSL (Secure Server) ID or 128-bit SSL (Global Server) ID.

Some older versions of popular browsers only support 40-bit or 56-bit encryption. Since it impossible to forecast the browsers that may be used in a visitor-based network, Nomadix recommends implementing a 40-bit Public Key.

During the process, VeriSign will ask for your business information and verification. There are several ways to proof the existence of your business. Please follow the instruction from VeriSign carefully. In addition, there is one section about generating a CSR; however, since you have already created the CSR in step 2 with OpenSSL, you can skip the instructions.

CSR Submission to VeriSign:



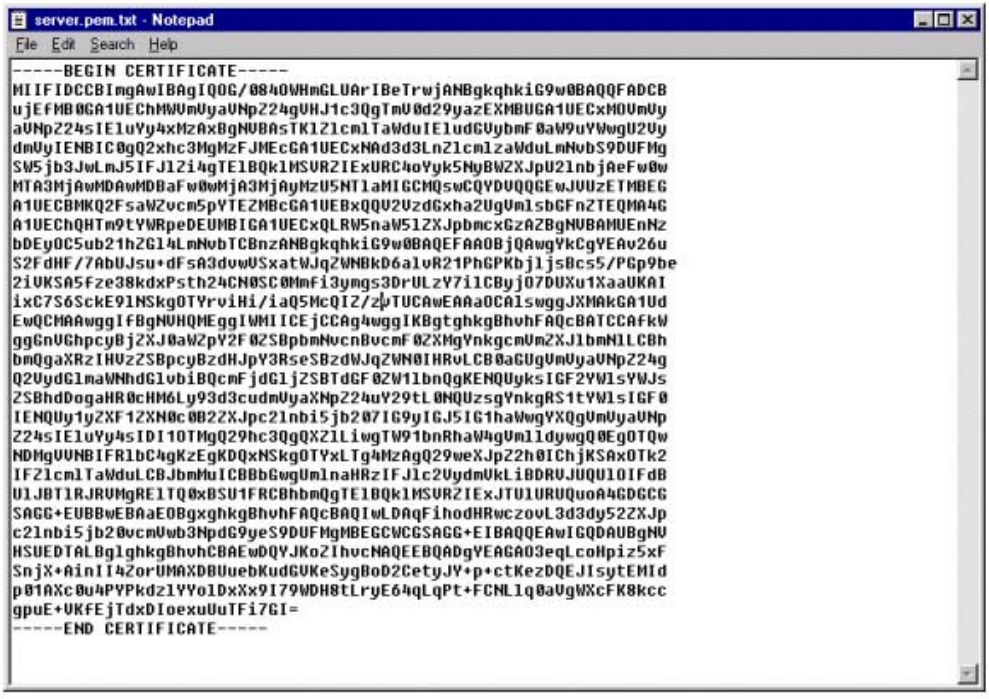
Please select “Apache Freeware” to submit the CSR to VeriSign. The Certificate Signing Request is in the server.csr (created in the previous step). Open server.csr and copy and paste all data into the edit box.

Select the purchase method and summit the required contact information.

For Expedited Service, you will typically be able to get the Public Key by email within two days. For Regular Service, you will typically be able to obtain the key within seven days.

When you receive an email from VeriSign with “Secure Server ID” (Global Server ID if you create a 128-bit key) that contains the Public Key information, cut and paste the key to paste it into a new file, named server.pem.

The file, “server.pem” will look like this:



You have now finished the process of obtaining a public key.

Setting Up Access Gateway for SSL Secure Login

FTP the “cakey.pem” and “server.pem” files into the Access Gateway platform's flash directory.

FTP to the Access Gateway by Netscape: ftp://username:password@[Access Gateway Network IP]/flash

Drag and drop the “cakey.pem” and “server.pem” files into the directory.

Changing Settings in the WMI

To change settings in the Web Management Interface (WMI), go to “Configuration Menu” on page 80.

Setting Up the Portal Page

System administrators can create login button(s) on the Portal Page, and can setup “http” links for regular logins, secure logins, or both. When subscribers enter the Portal Page, they can then choose either a regular login or a secure login. To setup the Portal Page, add the following:

For Regular Logins:

http://Access Gateway_ip:1111/usg/login?OS=http://after_login_finished_page.html

For Secure Logins:

https://Certificate_DNS_Name:1112/usg/login?OS=http://after_login_finished_page.html

Mirroring Billing Records

Multiple Access Gateway units can send copies of credit card billing records to a number of external servers that have been previously defined by system administrators. The Access Gateway assumes control of billing transmissions and saving billing records. By effectively "mirroring" the billing data, the Access Gateway can send copies of billing records to predefined "carbon copy" servers.

Additionally, if the primary and secondary servers are down, the Access Gateway can store up to 2,000 credit card transaction records. The Access Gateway regularly attempts to connect with the primary and secondary servers. When a connection is re-established (with either server), the Access Gateway sends the cached information to the server. Customers can be confident that their billing information is secure and that no transaction records are lost.

This document describes the process used by the Access Gateway for mirroring billing records, and is organized into the following sections:

- "Sending Billing Records" on page 338
- "XML Interface" on page 339
- "Establishing Billing Records "Mirroring" {Bill Record Mirroring}" on page 101

Sending Billing Records

When there is a message (billing record) in the message queue, the system "wakes up" and performs the following tasks:

1. Stores the billing record in the flash
2. Create an XML packet, based on the new billing record
3. Send the billing record to the carbon copy server(s)
4. Transmit the data currently stored in the flash, based on the specified retransmission method (round-robin: A-B-A-B, or fail-over: A-A-B-B)

The system stores the billing record in the flash so that the record will not be lost (for example, if the Access Gateway is powered down during transmission attempts.

Billing records are sent to the carbon copy server(s) only after the records are placed in the message queue. Carbon copy servers will not receive the records again if a task for retransmitting to the primary or secondary server needs to be performed.

XML Interface

XML for the External Server

The Access Gateway sends a string of XML commands according to specifications. HTTP headers are added to the XML packets that are built, as the billing “mirroring” information is sent to the external server in HTTP compliant XML format. Content-length has also been added to the HTTP post.

The XML string built from the billing mirror record is in the following format:

Access Gateway to External Server:

<USG RMTLOG_COMMAND="ADD_REC">

<REC_NUM>max 4 characters </REC_NUM>
<USG_ID>max 6 characters </USG_ID>
<PROPERTY_ID>max 64 characters</PROPERTY_ID>
<DATE>max 10 characters </DATE>
<TIME>max 8 characters</TIME>
<ROOM_NUM>max 20 characters</ROOM_NUM>
<AMOUNT>max 10 characters</AMOUNT>
<TRANS_TYPE>max 5 characters </TRANS_TYPE>

</USG>

Format for each field:

REC_NUM:00923 (numbers only, no alpha characters)
Access Gateway_ID:00020b
PROPERTY_ID:Any regular string
DATE:03/30/2001 (mm/dd/yyyy)
TIME:23:41:38 (24 hour format)
ROOM_NUM:Any regular string
AMOUNT:234.34
TRANS_TYPE:CC
RESULT_VALUE:OK or ERROR
IP:Standard IP address format (123.123.123.123)

The packet after the HTTP headers added looks like this:

```
POST  http://testing.com/brm HTTP/1.0
Content-Type: text/xml
Content-Length: 249
Host: 172.168.0.4

<USG COMMAND="ADD_REC">
      <REC_NUM>0000</REC_NUM>
      <USG_ID>012345</USG_ID>
      <PROPERTY_ID>USGII</PROPERTY_ID
>
      <DATE>03/19/2004</DATE>
      <TIME>10:12:56</TIME>
      <ROOM_NUM>5</ROOM_NUM>
      <AMOUNT>1800.00</AMOUNT>
      <TRANS_TYPE>2</TRANS_TYPE>
</USG>
```

XML to Access Gateway

The Access Gateway accepts a single line of XML text in the specified format. The XML string is a command sent by the External Server to the Access Gateway product. In this case, the acknowledgement received from the External Server forms the command. The Access Gateway expects the acknowledgement in the following format:

External Server to Access Gateway:

```
<USG COMMAND="RMTLOG_ACK">
    <ACK_VALUE>RESULT_VALUE</ACK_VALUE>
    <IP_ADDR>Server IP</IP_ADDR>
    <ERROR_CODE>ERROR_CODE</ERROR_CODE>
</USG>
```

Example of a Positive Acknowledgement:

```
<USG COMMAND="RMTLOG_ACK">
    <ACK_VALUE>OK</ACK_VALUE>
    <IP_ADDR>11.22.33.44</IP_ADDR>
    <ERROR_CODE>1</ERROR_CODE>
</USG>
```

Example of a Negative Acknowledgement:

```
<USG COMMAND="RMTLOG_ACK">
    <ACK_VALUE>ERROR</ACK_VALUE>
    <IP_ADDR>11.22.33.44</IP_ADDR>
    <ERROR_CODE>5</ERROR_CODE>
</USG>
```

Format for each Field:

RESULT_VALUE:OK or ERROR

IP:Standard IP format (123.123.123.123)

ERROR_CODE1 for OK, or any other number

Please contact Nomadix Technical Support for the complete XML DTD. Refer to "Contact Information" on page 349.

For more information about Billing Records Mirroring, see also:

- "Billing Records Mirroring" on page 10
- "Establishing Billing Records "Mirroring" {Bill Record Mirroring}" on page 101

Troubleshooting

This chapter provides information to help you resolve common hardware and software problems. It also contains a list of known error messages associated with the Management Interface.

- General Hints and Tips
- Management Interface Error Messages
- Common Problems

General Hints and Tips

The Access Gateway is both a hardware device and a powerful software utility. As a hardware computing device, the Access Gateway requires careful handling. It should be positioned in a dust-free and temperature-controlled environment. Never block the unit's ventilation holes, and do not stack with other equipment (unless correctly mounted in a rack). If you suspect the unit is overheating, check that the internal cooling fan is operating correctly. The fan should run freely and silently at all times. The power cord and the UTP patch cables must have an unrestricted path between the unit and their destinations. Ensure that the RJ45 connectors are firmly located in their receptacles. Applying these guidelines should ensure trouble-free operation.

Management Interface Error Messages

The following table contains the error messages associated with the Management Interface (CLI and Web). All messages are listed alphabetically.

Error Message	Cause
AAA must be enabled before adding a subscriber to the profile database.	You are attempting to add a subscriber profile while AAA is disabled.
Command not available “xx”	The system does not recognize your command (“xx” denotes your input).
Current settings were not archived.	This message is displayed if you answer “no” when prompted to overwrite the configuration archive file with new settings.
Current settings were not changed.	This is either a response to your decision not to change settings, or the message is generated by the system when it fails to locate the data it needs.
Error loading factory settings.	The system cannot find the default configuration file when attempting to restore the factory settings.
Error occurred, ARP entry not added.	The IP or MAC address is invalid. Ensure that you input the correct format for these fields.
NFS client support not included.	This message is displayed when the system reboots and NFS clients are not supported.
No matching MAC address found in profile database.	The system could not match the MAC address you defined while attempting to remove a subscriber profile.
[not defined]	This is the factory default for some system parameters.
The system must be reset to function properly. The system must be rebooted to function properly!	You have made changes to the system’s configuration that requires you to reboot before your changes become effective.

Error Message	Cause
Warning: before using this command you must FTP a valid boot image to the flash.	When upgrading the software, the system needs the new boot image file. You must FTP the file from NOMADIX™ to your local hard drive.
Warning: no DHCP services are available to subscribers.	This message is displayed because you have disabled both the external DHCP relay and the system's DHCP service. To make DHCP available to subscribers, at least one of these functions must be enabled.
"x" is ambiguous.	The system has more than one option it can display. You must provide additional characters to narrow the system's choices down to just one.
"xxx" is invalid, enter ...	Your input is not recognized by the system.

Common Problems

If you are having problems, you may find the answers here.

Problem	Possible Cause	Solution
When using the internal AAA login Web server, you cannot communicate with Authorize.Net.	The internal AAA login server communicates with Authorize.Net on a specified port which is not enabled within the company's firewall.	Enable communications with Authorize.Net on port 1111.
When a subscriber who is enabled with DHCP logs onto the system, they are not assigned an IP address.	The DHCP relay is enabled with an incorrect IP address for the external DHCP server.	Check the IP address for the external DHCP server. If necessary, test the communication with the "ping" command.
	The DHCP relay is enabled with the correct IP address for the external DHCP server, but the DHCP server is misconfigured.	Check the external DHCP server settings (for example, is it configured to a routable class of IP addresses? Are there enough IP address specified? If you specified a subnet, is it correct?). If you suspect the subnet, try using 255.255.255.0
	The DHCP relay is disabled and the DHCP service settings in the Access Gateway are misconfigured.	Check the internal DHCP service settings.
Subscribers are unable to route to a domain name, but they can route to an IP address.	The DNS server settings are misconfigured.	Check the DNS settings (host, domain, and the primary, secondary, and tertiary DNS).
	The DNS server is down.	Check with the service provider. Is the DNS server down?

Problem	Possible Cause	Solution
When a subscriber logs in for the first time, their browser is not redirected to the specified home page.	Home page redirection is not enabled in the Access Gateway.	Enable home page redirection.
	The home page URL was entered into the Access Gateway incorrectly.	Re-enter the correct URL.
	The server that hosts the home page is down, or the service provider (if different from the host) is not able to route to your page.	Check that the server is operational and that the home page can be accessed through your service provider (if different).
	DNS is misconfigured in the Access Gateway.	Check the DNS settings (host, domain, and the primary, secondary, and tertiary DNS).

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Appendix A: Technical Support

We have tried to ensure that you get the most up-to-date information available about the Access Gateway, and we hope this User Guide has met all your operational and performance needs. However, we understand that occasionally you may run into problems that require additional technical support.

"Troubleshooting" on page 343 provides some basic troubleshooting information and procedures that will help you to diagnose and solve your problem (if the problem is related to the Access Gateway). Additionally, you should check with your network documentation to verify that the network components are functioning correctly.

If you cannot resolve the problem with your documentation resources, try visiting our corporate Web site. We may have new information posted here that addresses your issues.

If you are still having problems, our friendly and experienced technical support team is always ready to assist you.

When contacting technical support, please have your Access Gateway's serial number available. The serial number is located on the bottom panel of your Access Gateway.

Contact Information

You can contact us by Email, fax, telephone, or regular mail.

Telephone

++1.818.575.2590

E-mail

support@nomadix.com

Fax

++1.818.597.1502

Address

Nomadix, Inc.
30851 Agoura Rd, Suite 102
Agoura Hills, CA 91301
USA
Attn: Technical Support

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Appendix B: Glossary of Terms

802.11x
Refers to a family of specifications developed by the IEEE for wireless LAN technology. 802.11 specifies an over-the-air interface between a wireless client and a base station, or between two wireless clients. The IEEE accepted the specification in 1997. There are several specifications in the 802.11 family:

802.11
Applies to wireless LANs and provides 1 or 2 Mbps transmission in the 2.4 GHz band using either Frequency Hopping Spread Spectrum (FHSS) or Direct Sequence Spread Spectrum (DSSS).

802.11a
An extension to 802.11 that applies to wireless LANs and provides up to 54 Mbps in the 5GHz band. 802.11a uses an Orthogonal Frequency Division Multiplexing (OFDM) encoding scheme rather than FHSS or DSSS.

802.11b
(also referred to as 802.11 High Rate or Wi-Fi™) An extension to 802.11 that applies to wireless LANs and provides 11 Mbps transmission (with a fallback to 5.5, 2 and 1 Mbps) in the 2.4 GHz band. 802.11b uses only DSSS. 802.11b was a 1999 ratification to the original 802.11 standard, allowing wireless functionality comparable to Ethernet.

802.11g
Applies to wireless LANs and provides 20+ Mbps in the 2.4 GHz band.

802.1Q
An IEEE standard for providing a virtual LAN capability within a campus network. 802.1Q establishes a standard format for frame tagging (Layer 2 VLAN markings), enabling the creation of VLANs that use equipment from multiple vendors.

10/100 Ethernet
See Ethernet.

AAA
(Authentication, Authorization, and Accounting) A combination of commands used by Nomadix Gateways to authenticate, authorize, and subsequently bill subscribers for their use of the customer's network. When a subscriber logs into the system, their unique MAC address is placed into an authorization table. The system then authenticates the subscriber's MAC address and billing information before allowing them to access the Internet and make online purchases. See also, MAC Address.

Access Concentrator
A type of multiplexer that combines multiple channels onto a single transmission medium in such a way that all the individual channels can be simultaneously active. For example, ISPs use concentrators to combine their dial-up modem connections onto faster T-1 lines that connect to the Internet. Concentrators are also used in Local Area Networks (LANs) to combine transmissions from a cluster of nodes. In this case, the concentrator is often called a hub.

Access Router
A router at a customer site, which connects to the network service provider. Also known as a Customer Premises Equipment (CPE) router. See also, Router.

ACK
(ACKnowledgment) If all the transmitted data is present and correct, the receiving device sends an ACK signal, which acts as a request for the next data packet.

Adaptive Configuration Technology
A Nomadix, Inc. patented technology that enables Dynamic Address Translation. See also, DAT.

ad-hoc mode
An 802.11x networking framework in which devices or stations communicate directly with each other, without the use of an Access Point (AP). Ad-hoc mode is also referred to as peer-to-peer mode, or an Independent Basic Service Set (IBSS). Ad-hoc mode is useful for establishing a network where wireless infrastructure does not exist or where services are not required.

ADSL
(Asynchronous Digital Subscriber Line) A method for moving data at high speed over regular phone lines.

AP
(Access Point) A hardware device or a computer's software that acts as a communication hub for users of a wireless device to connect to a wired LAN. APs are important for providing heightened wireless security and for extending the physical range of service a wireless user has access to.

ARP
(Address Resolution Protocol) Used to dynamically bind a high level IP address to a low level physical hardware address. ARP is limited to a single physical network that supports hardware broadcasting.

ATM
(Asynchronous Transfer Mode) A network technology based on transferring data in “cells” or packets of a fixed size (53 bytes each). The cell used with ATM is relatively small compared to units used with older technologies. The small, constant cell size allows ATM equipment to transmit video, audio, and computer data over the same network, and assures that no single type of data monopolizes the line. ATM can offer multi-gigabit bandwidth. See also, Bandwidth and Packet.

Bandwidth
The maximum speed at which data can be transmitted between computers across a network, usually measured in bits per second (bps). If you think of the communication path as a water pipe, the bandwidth represents the width of the pipe which consequently determines how many gallons of water can flow through it at any given time. See also, Broadband.

Beacon Interval
The frequency interval of the beacon, which is a packet broadcast by a router to synchronize a wireless network.

Broadband
A high speed data transmission medium capable of supporting a wide range of varying frequencies. Broadband can carry multiple signals at fast rates of speed by dividing the total capacity of the medium into multiple, independent bandwidth channels, where each channel operates only on a specific range of frequencies. See also, Bandwidth.

BSS
(Basic Service Set) See infrastructure mode.

Carrier frequency
A frequency in a communications channel modulated to carry analog or digital signal information. For example, an FM radio transmitter modulates the frequency of a carrier signal and the receiver processes the carrier signal to extract the analog information. An AM radio transmitter modulates the amplitude of a carrier signal.

CoS
(Class of Service) A category based on the type of user, type of application, or some other criteria that QoS systems can use to provide differentiated classes of service. The characteristics of the CoS may be appropriate for high throughput traffic, for traffic with a requirement for low latency, or simply for best effort. The QoS experienced by a particular flow of traffic will be dependent on the number and type of other traffic flows admitted to its class. See also, QoS.

Daemon
A program that runs continuously in the background, or is activated by a particular event (for example, an error may trigger Syslog). The word daemon is Greek for “spirit” or “soul.” See also, SYSLOG.

DAT
(Dynamic Address Translation) Nomadix Gateways provide “plug-and-play” access to subscribers who are misconfigured with static (permanent) IP addresses, or subscribers that do not have DHCP functionality on their computers. DAT is a Nomadix, Inc. patented technology that allows all users to obtain network access, regardless of their computer’s network settings. See also, DHCP.

DHCP
(Dynamic Host Configuration Protocol) A standard method for assigning IP addresses automatically to devices connected on a TCP/IP network. When a new device connects to the network, the DHCP server assigns an IP address from a list of its available addresses. The device retains this IP address for the duration of the session. When the device disconnects from the network, the IP address becomes available for reassignment to another device. See also, Dynamic IP Address, IP Address, Static IP Address, and TCP/IP.

DNS
(Domain Name System) A system that maps meaningful domain names with complex numeric IP addresses. See also, Domain Name and IP Address.

Domain Name
A unique and meaningful name representing each addressable computing device on a dynamic network (for example, the Internet). Some devices have more than one domain name. When a user types a domain name, requesting a connection to the device, DNS converts the domain name into a numeric IP address. The location of the device on the network is known by its IP address. WWW.YAHOO.COM is an example of a commercial domain name on the World Wide Web. See also, DNS, Internet, and IP Address.

Driverless Print Servers
Servers that can bill subscribers’ rooms for printing their documents without them having to install printers. See also, Print Billing Command.

DSSS
(Direct Sequence Spread Spectrum) One of two types of spread spectrum radio—the other being Frequency Hopping Spread Spectrum (FHSS). DSSS is a transmission technology used in WLAN transmissions where a data signal at the sending station is combined with a higher data rate bit sequence, or “chipping” code, that divides the user data according to a spreading ratio. The chipping code is a redundant bit pattern for each bit that is transmitted, which increases the signal's resistance to interference. If one or more bits in the pattern are damaged during transmission, the original data can be recovered due to the redundancy of the transmission.

DTIM
(Delivery Traffic Indication Message) A message included in data packets that can increase wireless efficiency.

Dynamic IP Address
A temporary IP address that is assigned by the DHCP server to a device. Devices retain dynamic IP addresses only for the duration of their networking session. When a device disconnects from the network, the IP address is recaptured by the DHCP server and becomes available for reassignment to another device. See also, DHCP, IP Address, IP Address Translation, Static IP Address, and Translation.

EAP
(Extensible Authentication Protocol) An extension to PPP. EAP is a general protocol for authentication that also supports multiple authentication methods (for example, public key authentication and smart cards). IEEE 802.1x specifies how EAP should be encapsulated in LAN frames. In wireless communications using EAP, a user requests connection to a WLAN through an AP, which then requests the identity of the user and transmits that identity to an authentication server such as RADIUS. The server asks the AP for proof of identity, which the AP gets from the user and then sends back to the server to complete the authentication.

ECommerce
A business venture between a supplier and its customers using online services (for example, the Internet). Both parties use online services to conduct business transactions. Transactions may include generating orders, invoices, and payments, and submitting inquiries. Also known as *Enterprise*.

ESS
(Extended Service Set) See infrastructure mode.

Ethernet
A Local Area Network (LAN) protocol developed by Xerox Corporation in cooperation with DEC and Intel in 1976. Ethernet uses a bus or star topology and supports data transfer rates of 10 Mbps. The Ethernet specification served as the basis for the IEEE 802.3 standard, which specifies the physical and lower software layers. Ethernet is one of the most widely implemented LAN standards. A newer version of Ethernet, called 100Base-T (or Fast Ethernet), supports data transfer rates of 100 Mbps. The latest version, Gigabit Ethernet, supports data rates of 1 Gigabit (1,000 Mbps) per second. See also, Mbps.

Fast Ethernet
See Ethernet.

FCC
(Federal Communications Commission) US wireless regulatory authority. The FCC was established by the Communications Act of 1934 and is charged with regulating Interstate and International communications by radio, television, wire, satellite and cable.

FDM
(Frequency Division Multiplexing) A multiplexing technique that uses different frequencies to combine multiple streams of data for transmission over a communications medium. FDM assigns a discrete Carrier frequency to each data stream and then combines many modulated carrier frequencies for transmission. For example, television transmitters use FDM to broadcast several channels at once.

FHSS
(Frequency Hopping Spread Spectrum) One of two types of spread spectrum radio—the other being Direct-Sequence Spread Spectrum (DSSS). FHSS is a transmission technology used in WLAN transmissions where the data signal is modulated with a narrowband carrier signal that “hops” in a random but predictable sequence from frequency to frequency as a function of time over a wide band of frequencies. The signal energy is spread in time domain rather than chopping each bit into small pieces in the frequency domain. This technique reduces interference because a signal from a narrowband system will only affect the spread spectrum signal if both are transmitting at the same frequency at the

same time. If synchronized properly, a single logical channel is maintained. The transmission frequencies are determined by a “spreading” or “hopping” code. The receiver must be set to the same hopping code and must listen to the incoming signal at the right time and correct frequency in order to properly receive the signal. Current FCC regulations require manufacturers to use 75 or more frequencies per transmission channel with a maximum dwell time (the time spent at a particular frequency during any single hop) of 400 ms.

Flash Memory

A special type of EEPROM (Electrically Erasable Programmable Read Only Memory) that can be erased and reprogrammed in blocks instead of one byte at a time. Many modern PCs have their BIOS stored on a flash memory chip so that it can easily be updated. Such a BIOS is sometimes called a flash BIOS. Flash memory is also popular in modems because it enables the modem manufacturer to support new protocols as they become standardized.

Forwarding Rate

The maximum rate at which 64K packets can be delivered to their destination. See also, Packet, Packet Switching Network, pps, and Throughput.

Fragment Length (Fragmentation)

Breaking a packet into smaller units when transmitting over a network medium that cannot support the original size of the packet. The fragment length value should remain at its default setting unless you experience a high packet error rate. Setting the fragment length too low may result in poor performance.

FTP

(File Transfer Protocol) A standard protocol used for copying and moving files quickly, efficiently, and securely across public and private networks. An FTP site is one where files are available for downloading and uploading. FTP sites usually require a secure login (name and password) to gain access.

Gateway

Any device that provides a seamless connection between otherwise incompatible systems.

Gopher

A computer program, and an accompanying data transfer protocol, for reading information that has been made available to the public on the Internet. Gopher is gradually being superseded by HTML.

Home Page

Usually the first page users see when they visit a Web site (if they address the home page’s URL). A well constructed Web site will normally consist of a home page that provides a clear and concise overview of the entire Web site, together with the tools for accessing other pages and topics quickly and efficiently. In this case, the home page is the “portal” to the Web site. See also, Portal and URL.

Host

Any computer that provides services to other computers that are linked to it by a network. Generally, the host is the more remote of the computers. For example, if a user in California accesses a computer in New York, the computer in New York is considered the host.

HPR

(Home Page Redirection) Nomadix Gateways enable solution providers to redirect subscribers to a “portal” home page of their choice. This allows the solution provider to generate online advertising revenues and increase business exposure. See also, Home Page.

HTML

(HyperText Markup Language) The programming language used to create hypertext documents for use on the Internet. See also, HTTP, Hypertext, and Internet.

HTTP
(HyperText Transfer Protocol) The standard method used for publishing hypertext documents in HTML format on the Internet. See also, HTML and Internet.

Hypertext
Electronic documents that are structured to enable readers to go directly to the source of the information they need by following directional links (unlike books which are generally read sequentially). Web pages and help file are examples of hypertext documents.

ICMP
(Internet Control Message Protocol) A standard Internet protocol that delivers error and control messages from hosts to message requesters. An ICMP echo test can determine whether a target destination is reachable. An ICMP echo test is also called a ping. See also, Ping.

IEEE
(Institute of Electrical and Electronics Engineers) Founded in 1884, the IEEE is an organization composed of engineers, scientists, and students. The IEEE is best known for developing standards for the computer and electronics industry. In particular, the IEEE 802 standards for Local Area Networks are widely followed.

iNAT™
(Intelligent Network Address Translation) Nomadix' iNAT™ feature creates an intelligent mapping of IP addresses and their associated VPN tunnels allowing multiple tunnels to be established to the same VPN server—creating a seamless connection for all the users at the public-access location.

infrastructure mode
An 802.11x networking framework in which devices communicate with each other by first going through an Access Point (AP). In infrastructure mode, wireless devices can communicate with each other or can communicate with a wired network. When one AP is connected to a wired network and a set of wireless stations it is referred to as a Basic Service Set (BSS). An Extended Service Set (ESS) is a set of two or more BSSs that form a single subnetwork. Most corporate wireless LANs operate in infrastructure mode because they require access to the wired LAN in order to use services such as file servers or printers. See also, ad-hoc mode.

Internet
Originally developed by the U.S. Defense Department, the Internet is now a global collection of networks that transfer information between each other using the Internet Protocol (IP). Additionally, the Internet carries the hypertext system commonly known as the World Wide Web. See also Hypertext and Internet Protocol.

Internet Protocol
The global standard used to regulate data transmissions between computers and the Internet. Data is broken up into packets which are then sent over the network. By using IP addressing, Internet Protocol ensures that the data reaches its destination, even though different packets may pass through different networks to get to the same location. See also, Internet and IP Address.

Internet Service Provider
The agency that provides you with access to the Internet. Your Internet Service Provider (ISP) may be a large commercial organization (for example, America Online) or, if you access the Internet via your employer, then your employer is your Internet Service Provider. See also, Internet.

Intranet
A network confined to a single organization (but not necessarily a single site). Usually thought of as a corporate mini Internet.

IP
See Internet Protocol.

IP Address

The numeric address of a device, in the format used on the Internet. The actual numeric value takes the form of a 32-bit binary number broken up into four 8-bit groups, with each group separated by a period (for example, 198.43.7.85). To make it easier for the user, the IP address is mapped to a meaningful domain name. IP addresses can be static (permanent) or dynamic (assigned each time you connect). See also, Domain Name, Dynamic IP Address, Internet Protocol, and Static IP Address.

IP Address Translation

Nomadix Gateways use adaptive configuration technology which can accommodate all network configurations, including dynamic and static IP address assignments. This enables it to solve IP addressing problems in environments where the service provider does not have control over the subscriber's network settings. Whenever a subscriber logs on, your Nomadix Gateway automatically translates their computer's network settings to provide them with seamless access to the broadband network. Subscribers no longer need to alter their computer's settings. See also, Dynamic IP Address, IP Address, and Static IP Address.

ISDN

(Integrated Services Digital Network) An international communications standard for sending voice, video, and data over digital telephone lines or normal telephone wires. ISDN supports data transfer rates of 64 Kbps (64,000 bits per second).

ISP

See Internet Service Provider.

LAWN

(Local Area Wireless Network) A type of Local Area Network that uses high-frequency radio waves rather than wires to communicate between nodes. Also referred to as WLAN. See also, Node.

LDAP

(Lightweight Directory Access Protocol) Directories containing information such as names, phone numbers, and addresses are often stored on a variety of incompatible systems. LDAP provides a simple protocol that allows you to access and search these disparate directories over the Internet. LDAP is commonly used for online billing applications.

MAC Address

(Media Access Control) The hardware address that uniquely identifies each node of a network. In IEEE 802 networks, the Data Link Control (DLC) layer of the OSI Reference Model is divided into two sub layers – the Logical Link Control (LLC) layer and the Media Access Control (MAC) layer. The MAC layer interfaces directly with the network media. Consequently, each type of network media requires a different MAC layer. On networks that do not conform to the IEEE 802 standards but do conform to the OSI Reference Model, the node address is called the Data Link Control (DLC) address.

Mbps

(Megabits per second) A standard measure for data transmission speeds (for example, the rate at which information travels over the Internet). 1 Mbps denotes one million bits per second. Several factors can influence how quickly data travels, including modem speed, bandwidth capacity, and Internet traffic levels at the time of transmission. Not to be confused with MegaBytes per second (MBps). See also, Throughput.

MIB

(Management Information Base) A set of parameters an SNMP management station can query or establish in the SNMP agent of a network device (for example, a router). Standard minimal MIBs have been defined, and vendors often have their own private enterprise MIBs. In theory, any SNMP manager can talk to any SNMP agent with a properly defined MIB. See also, SNMP.

Misconfigured User

A Nomadix, Inc. term used to describe users who have IP address configurations that are different from the current network. For example, if the current network is 123.45.67.89 but the user's IP address is 10.10.10.15, then this user is considered to be "misconfigured."

NAT

(Network Address Translation) An Internet standard that enables a Local Area Network (LAN) to use one set of IP addresses for internal traffic and a second set of IP addresses for external traffic. A NAT box located where the LAN meets the Internet performs all the necessary IP address translations. NAT provides a type of firewall by hiding its internal IP addresses. Additionally, NAT enables companies to use more internal IP addresses (because the addresses are only used internally and there's no possibility of conflicting with IP addresses used by other companies). NAT also allows companies to combine multiple ISDN connections into a single Internet connection. See also, ISDN.

Node

An addressable point on a network. A node can connect a computer system, a terminal, or various peripheral devices to the network. Each node on a network has a distinct name. On the Internet, a node is a host computer with a unique domain name and IP address. See also, Domain Name and IP Address.

NTP

(Network Time Protocol) An Internet standard protocol (built on top of TCP/IP) that assures accurate synchronization (to the millisecond) of computer clock times in a network of computers. Based on UTC, NTP synchronizes client workstation clocks to the U.S. Naval Observatory master clocks. Running as a continuous background client program on a computer, NTP sends periodic time requests to servers, obtaining server time stamps and using them to adjust the client's clock.

OFDM

(Orthogonal Frequency Division Multiplexing) An FDM modulation technique for transmitting large amounts of digital data over a radio wave. OFDM works by splitting the radio signal into multiple smaller sub-signals that are then transmitted simultaneously at different frequencies to the receiver. OFDM reduces the amount of crosstalk in signal transmissions. 802.11a WLAN technology uses OFDM.

OSPF

(Open Shortest Path First) This routing protocol was developed for IP networks based on the shortest path first or link-state algorithm. Routers use link-state algorithms to send routing information to all nodes on a network by calculating the shortest path to each node based on a topography of the Internet constructed by each node. Routers send that portion of the routing table (keeping track of routes to particular network destinations) that describes the state of its own links, and it also sends the complete routing structure (topography). The advantage of shortest path first algorithms is that they result in smaller more frequent updates everywhere. They converge quickly, thus preventing such problems as routing loops and count-to-infinity (when routers continuously increment the hop count to a particular network). This makes for a stable network. OSPF (version 2) is defined in RFC 1583 and is rapidly replacing RIP on the Internet as the preferred routing protocol. See also, RFC and Router.

Packet

How data is distributed over the Internet. A packet contains the source and destination addresses, as well as the data. An ethernet packet is normally 1,518 bytes. In IP networks, packets are often called datagrams. See also, Forwarding Rate, Packet Switching Network, pps, and Throughput.

Packet Switching Network

Refers to protocols in which messages are divided into packets before they are sent. Each packet is then transmitted individually and can even follow different routes to its destination. Once all the packets forming a message arrive at its destination, they are recompiled into the original message. Most modern Wide Area Network (WAN) protocols, including TCP/IP, X.25, and Frame Relay, are based on packet-switching technologies. By contrast, normal telephone services use a circuit-switching technology in which a dedicated line is allocated for transmission between two parties. Circuit-switching is ideal for fast data transmissions where the data must arrive in the same order in which it is sent. This is the case with most real-time data, such as live audio and video. Packet switching is more efficient and robust for data that can withstand some delays in transmission, such as e-mail messages and Web pages. See also, Forwarding Rate, Packet, pps, and Throughput.

PDF

(Portable Document Format) A type of file format developed by Adobe Systems© that displays documents identically on any computer system. PDF files retain their original formatted design, unlike HTML documents which adjust the format depending on the users viewing medium (for example, monitor size).

Ping

(Packet INternet Groper) A program that transmits a signal to a host and expects a response within a predetermined time. This is useful when troubleshooting network transmission problems. See also, ICMP.

Portal

A portal is a Web site. The portal consists of a collection of links to the most popular Web services on the Internet. Generally speaking, a portal is a door to the Internet. See also, Internet.

PPP

(Point-to-Point Protocol) PPP has superseded SLIP as the standard protocol for serial data communications over the Internet. See also, SLIP.

pps

(packets per second) The rate at which packets are delivered to their destination. See also, Forwarding Rate, Packet, and Packet Switching Network.

PPTP

(Point-to-Point Tunneling Protocol) Developed jointly by Microsoft Corporation, U.S. Robotics, and several remote access vendor companies, known collectively as the PPTP Forum, PPTP is a new technology used for creating Virtual Private Networks (VPNs). Because the Internet is essentially an open network, PPTP is used to ensure that messages transmitted from one VPN node to another are secure. PPTP allows users to dial in to their corporate networks via the Internet. See also, Internet, Tunneling, and VPN.

Preamble

In wireless networks, part of the wireless signal that synchronizes network traffic.

Print Billing Command

Authentication, Authorization and Accounting configuration that allows the NSE to support Driverless Print servers that can bill subscribers' rooms for printing their documents without them having to install printers.

Profile

An electronic file that defines how subscribers normally interact with the service provider's network.

Protocol
A standard process consisting of a set of rules and conditions that regulates data transmissions between computing devices. Some examples of protocols include HTTP (HyperText Transfer Protocol), FTP (File Transfer Protocol), TCP/IP (Transmission Control Protocol/Internet Protocol), and POP (Post Office Protocol). All these protocols are responsible for regulating the transmission of their specific data file types.

QoS
(Quality of Service) A collective measure of the level of service delivered to the customer. QoS can be characterized by several basic performance criteria, including availability (low downtime), error performance, response time and throughput, lost calls or transmissions due to network congestion, connection set-up time, and the speed of fault detection and correction. Service providers may guarantee a particular level of QoS (defined by a service level agreement) to their subscribers. QoS-enabled hardware and software solutions sort and classify IP packet requests into different traffic classes and allocate the proper resources to direct traffic based on various criteria, including application type, user or application ID, source or destination IP address, time of day, and other user-specified variables. See also, CoS and ToS.

RADIUS
(Remote Authentication Dial-In User Service) An authentication and accounting system used by many Internet Service Providers (ISPs). When you dial in to the ISP you must enter your username and password. This information is passed to a RADIUS server which checks that the information is correct and then authorizes access to the ISP system.

RFC
(Request for Comments) A series of notes about the Internet, started in 1969 (when the Internet was the ARPANET). An RFC note can be submitted by anyone. Each RFC is designated by an RFC number. Once published, an RFC never changes. Any modifications to an original RFC are assigned a new RFC number.

Roaming
In wireless networking, roaming refers to the ability to move from one AP coverage area to another without interruption in service or loss in connectivity.

Round Robin Queuing
An algorithm that services each queue in a predefined sequence. For example, it might empty 1,500 bytes apiece from queue 1 (high priority), queue 2 (medium priority), and queue 3 (low priority), servicing each in turn.

Router
A hardware device that connects two or more networks and routes the incoming data packets to the appropriate network.

RTS (Length)
(Request to Send) A packet sent when a computer has data to transmit. The computer will wait for a CTS (Clear To Send) message before sending data. The RTS Length value should remain at its default setting unless you encounter inconsistent data flow. Only minor modifications to this value are recommended

SLIP
(Serial Line Internet Protocol) SLIP is a standard protocol for connecting to the Internet with a modem over a phone line. It has trouble with noisy dial-up lines and other error-prone connections, so look to higher-level protocols like PPP for error correction.

SMTP
(Simple Mail Transfer Protocol) A standard protocol that regulates how e-mail is distributed over the Internet. See also, Protocol.

SNMP

(Simple Network Management Protocol) A standard protocol that regulates network management over the Internet. SNMP uses TCP/IP to communicate with a management platform, and offers a standard set of commands that make multi-vendor interoperability possible. SNMP uses a standard set of definitions, known as a MIB (Management Information Base), which can be supplemented with enterprise-specific extensions. See also, TCP/IP and MIB.

Socket

A communication path between two computer programs, not necessarily running on the same machine. Sockets are managed by a "socket device driver" that establishes network connections, as needed. Programs that communicate through sockets need not know anything about how the network functions.

Solution Provider

Vendors are considered to be solution providers when they provide products and/or services that meet their customer's specific needs. Normally, a solution provider is offering a solution that isn't readily available on the open market. For example, NOMADIX™ is a solution provider to its customers (broadband network service providers), and those customers are solution providers to their end users (network subscribers).

SSID

(Service Set Identifier) A 32-character unique identifier attached to the header of packets sent over a WLAN that acts as a password when a mobile device tries to connect to the BSS. The SSID differentiates one WLAN from another, so all access points and all devices attempting to connect to a specific WLAN must use the same SSID. A device will not be permitted to join the BSS unless it can provide the unique SSID. Because an SSID can be "sniffed" in plain text from a packet it does not supply any security to the network. An SSID is also referred to as a "network name" because essentially it is a name that identifies a wireless network.

SSL

(Secure Sockets Layer) A protocol developed by Netscape for transmitting private documents via the Internet. SSL works by using a private key to encrypt data that is transferred over the SSL connection. Both Netscape Navigator and Internet Explorer support SSL, and many Web sites use the protocol to obtain confidential user information, such as credit card numbers. See also, Protocol.

Static IP Address

An IP address that is assigned to a computing device permanently (or until the user changes it manually), unlike a dynamic IP address which is assigned to a device temporarily by the DHCP server. See also, DHCP, IP Address and Dynamic IP Address.

STP

(Spanning Tree Protocol) A link management protocol that is part of the IEEE 802.1 standard for media access control bridges. Using the spanning tree algorithm, STP provides path redundancy while preventing undesirable loops in a network that are created by multiple active paths between stations. Loops occur when there are alternate routes between hosts. To establish path redundancy, STP creates a tree that spans all of the switches in an extended network, forcing redundant paths into a standby (or blocked) state. STP allows only one active path at a time between any two network devices (this prevents the loops) but establishes the redundant links as a backup if the initial link should fail. If STP costs change, or if one network segment in the STP becomes unreachable, the spanning tree algorithm reconfigures the spanning tree topology and reestablishes the link by activating the standby path. Without spanning tree in place, it is possible that both connections may be simultaneously "live," which could result in an endless loop of traffic on the LAN.

Subnet

A portion of a network, which may be a physically independent network segment, which shares a network address with other portions of the network and is distinguished by a unique subnet address. In general, a subnet is to a network what a network is to the Internet.

Subnet Address
The subnet portion of an IP address that is dedicated to the subnet. In a subnetted network, the host portion of an IP address is split into a subnet portion and a host portion using an address (subnet) mask. See also, IP Address and Subnet.

Subnet Mask
See Subnet Address.

Subscriber
Any person or organization that pays a period fee for services.

SYSLOG
(SYStem LOGging) Syslog is the standard event logging subsystem for Unix and consists of a server daemon, a client function library, and a client command line utility. You can log to files, terminal devices, logged on users, or even forward to other syslog systems. See also, Daemon.

TCP
(Transmission Control Protocol) Manages data into small packets and ensures that the data is transmitted correctly over a network. If an error is detected, the data is transmitted again in its original form. See also, TCP/IP.

TCP/IP
(Transmission Control Protocol/Internet Protocol). A suite of protocols that regulates data communications for the Internet. See also, Internet Protocol, Protocol, and TCP.

Telnet
A software program and command utility used to connect between remote locations and services. Telnet connects you to the login prompt of another host (that you have access rights to). See also, Host.

Throughput
The net data transfer rate between an information source and its destination, using the maximum packet size without loss. Throughput is expressed as Megabits per second (Mbps), defined by RFC1242, Section 3.17. See also, Forwarding Rate, Mbps, Packet, Packet Switching Network, pps, and RFC.

TLS
(Transport Layer Security) A protocol that guarantees privacy and data integrity between client/server applications communicating over the Internet. The TLS protocol is made up of two layers:

TLS Record Protocol

Layered on top of a reliable transport protocol, such as TCP, it ensures that the connection is private by using symmetric data encryption and ensures that the connection is reliable. The TLS Record Protocol also is used for encapsulation of higher-level protocols, such as the TLS Handshake Protocol.

TLS Handshake Protocol

Allows authentication between the server and client and the negotiation of an encryption algorithm and cryptographic keys before the application protocol transmits or receives any data.

TLS is application protocol-independent. Higher-level protocols can layer on top of the TLS protocol transparently. Based on Netscape's SSL 3.0, TLS supersedes and is an extension of SSL. TLS and SSL are not interoperable. See also, Protocol and SSL.

Translation
See IP Address Translation.

Tunneling

A technology that enables one network to send its data via another network's connections. Tunneling works by encapsulating a network protocol within packets carried by the second network. For example, Microsoft's PPTP technology enables organizations to use the Internet to transmit data across a Virtual Private Network (VPN). It does this by embedding its own network protocol within the TCP/IP packets carried by the Internet. See also, TCP/IP and VPN.

ToS

(Type of Service) A field within an IP header which can be used by the device originating the packet, or by an intermediate networking device, to signal a request for a specific QoS level. ToS uses three bits to tell a router how to prioritize a packet and one bit apiece to signal requirements for delay, throughput, and reliability. See also, Packet, QoS, Router, and Throughput.

URL

(Uniform Resource Locator) The standard method used for identifying the location of information available to the Internet. This is effectively the “address” of a document or file, expressed in the form: *protocol://domain.filename/path.type* (for example, *http://www.myfile.com/nextpage.html*).

UTC

(Coordinated Universal Time) A time scale that couples Greenwich Mean Time (GMT), which is based solely on the Earth's inconsistent rotation rate, with highly accurate atomic time. When atomic time and Earth time approach a one second difference, a leap second is calculated into UTC. UTC was devised on January 1, 1972 and is coordinated in Paris by the International Bureau of Weights and Measures. UTC, like GMT, is set at 0 degrees longitude on the prime meridian

VoIP

(Voice over IP) An emerging technology for transporting integrated digital voice, video, and data over IP networks. A major advantage of VoIP and Internet telephony is that it avoids the tolls charged by ordinary telephone services. See also, Internet and IP.

VPN

(Virtual Private Network) A network that is constructed by using public wires to connect nodes. For example, there are a number of systems that enable you to create networks using the Internet as the medium for transporting data. These systems use encryption and other security mechanisms to ensure that only authorized users can access the network and that the data cannot be intercepted.

VxWorks ®

A real-time operating system, manufactured and sold by Wind River Systems of California, USA. VxWorks program development requires a host machine running Unix or Windows.

W3C

(World Wide Web Consortium) An international consortium of companies involved with the Internet and the Web. The organization's purpose is to develop open standards so that the Web evolves in a single direction rather than being splintered among competing factions. The W3C is the chief standards body for HTTP and HTML. See also, HTML and HTTP.

WAN

(Wide Area Network) Take two local area networks, hook them together, and you've got a WAN. Wide area networks can be made up of interconnected smaller networks spread throughout a building, a state, a country, or the entire globe.

WEP

(Wired Equivalent Privacy) A security protocol for wireless local area networks (WLANs) defined in the 802.11b standard. WEP is designed to provide the same level of security as that of a wired LAN. LANs are inherently more secure than WLANs because LANs are somewhat protected by the physicalities of their structure, having some or all of the network inside a building that can be protected from unauthorized access. WLANs, which are over radio waves, do not have the same physical structure and therefore are more vulnerable to tampering. WEP aims to provide security by encrypting data over radio waves so that it is protected as it is transmitted from one end point to another.

Wi-Fi™

(Wireless Fidelity) Used generically when referring of any type of 802.11 network, whether 802.11b, 802.11a, dual-band, etc. The term is promulgated by the Wi-Fi Alliance. Any products tested and approved as "Wi-Fi Certified" (a registered trademark) by the Wi-Fi Alliance are certified as interoperable with each other, even if they are from different manufacturers. A user with a "Wi-Fi Certified" product can use any brand of access point with any other brand of client hardware that also is certified. Typically, however, any Wi-Fi product using the same radio frequency (for example, 2.4GHz for 802.11b or 802.11g, or 5GHz for 802.11a) will work with any other product, even if that product is not "Wi-Fi Certified."

WLAN

(Wireless Local Area Network) Also referred to as LAWN. A type of local-area network that uses high-frequency radio waves rather than wires to communicate between nodes. See also, Node.

WMI

(Web Management Interface) The browser-based system administrators interface for all Nomadix Gateways.

WPA

(Wi-Fi™ Protected Access) A Wi-Fi™ standard that was designed to improve upon the security features of WEP. The technology is designed to work with existing Wi-Fi products that have been enabled with WEP (as a software upgrade to existing hardware), but the technology includes two improvements over WEP:

Improved data encryption through the temporal key integrity protocol (TKIP). TKIP scrambles the keys using a hashing algorithm and, by adding an integrity-checking feature, ensures that the keys haven't been tampered with.

User authentication, which is generally missing in WEP, through the extensible authentication protocol (EAP). WEP regulates access to a wireless network based on a computer's hardware-specific MAC address, which is relatively simple to be "sniffed out" and stolen. EAP is built on a more secure public-key encryption system to ensure that only authorized network users can access the network.

It should be noted that WPA is an interim standard that will be replaced with the IEEE's 802.11i standard upon its completion.

XML

(eXtensible Markup Language) A specification developed by the W3C. XML is a pared down version of SGML, designed especially for Web documents. It enables designers to create their own customized tags to provide functionality not available with HTML. For example, XML supports links that point to multiple documents, as opposed to HTML links, which can reference just one destination each. For all Nomadix Gateways, XML is used by the subscriber management module for port location and user administration. Enabling the XML interface allows your Nomadix Gateway to accept and process XML commands from an external source. XML commands are appended to a URL in the form of an encoded query string. Nomadix Gateways parse the query string, executes the commands specified by the string, and return data to the system that initiated the command request. See also, HTML, TCP, and W3C.